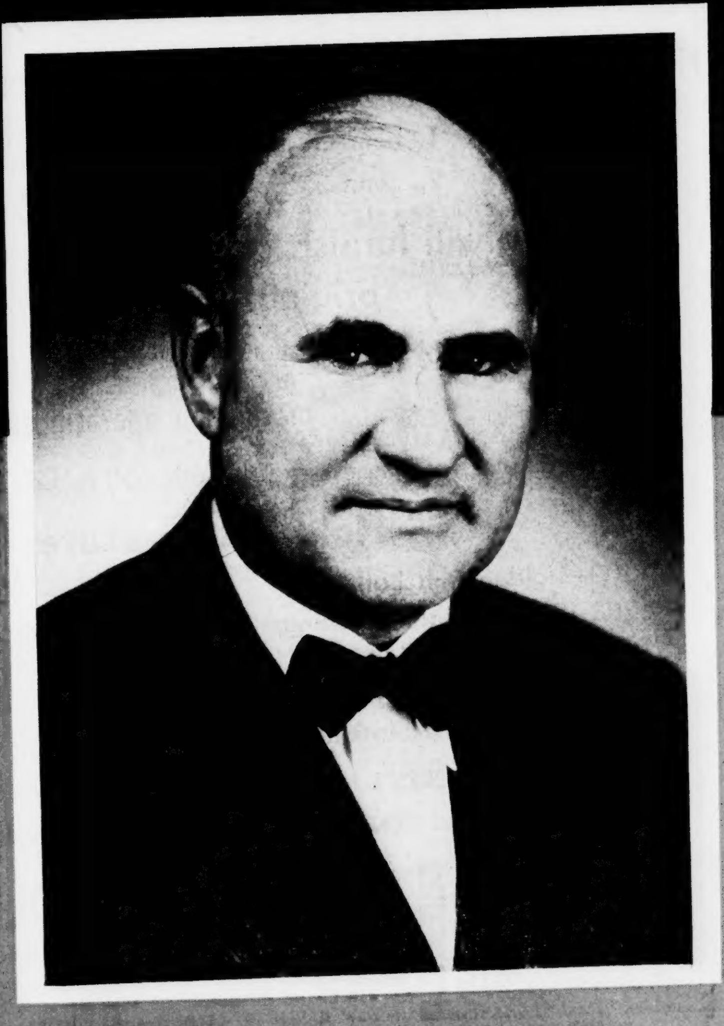
Metals Review

October 1957



Zay Jeffries
Director General
2nd WORLD METALLURGICAL CONGRESS
(See Article, Page 4)

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The News Digest Magazine

October 1957
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NATIONAL METAL CONGRESS AND EXPOSITION

2ND WORLD METALLURGICAL CONGRESS

NOV. 2-8, 1957, CHICAGO, ILL.

ASM Review of Metal Literature

Zay Jeffries, Director General 2nd World Metallurgical Congress

ZAY JEFFRIES, repeating the role he played so well as director general of the 1st World Metallurgical Congress held in 1951, is the driving force behind the accomplishments to date and the anticipated success of the 2nd World Metallurgical Congress, already on its way with nine groups of overseas conferees touring the industrial, research and development facilities of the Eastern United States on their way to participate in the 2nd W.M.C. in Chicago. All of which proves the old adage . . . if a man does a good job once, he can do it again!

Dr. Jeffries, a native of South Dakota and a graduate of the South Dakota School of Mines in 1910 with a B.S. degree in mining engineering, is a past president of the American Society for Metals, and past vice-president of the General Electric Co., from which he retired in 1950. He started his career as an instructor in metallurgy at Case School of Applied Science (now Case Institute of Technology) in 1911 and became assistant professor in 1916. He was a consultant for the National Lamp Works and the Incandescent Lamp Department at General Electric Co. for several years and acted in a consulting capacity for the Aluminum Co. of America over a long period of time.

The list of honors and medals accorded to Dr. Jeffries, "the Dean of American Metallurgists" is a long and distinguished one. He received a D.Sc. degree from Harvard University in 1918 and an honorary doctor of engineering degree from South Dakota School of Mines in 1930. He holds the James Douglas Medal of the American Institute of Mechanical Engineers (1924) and the Sauveur Achievement Award of the American Society for Metals (1935). In 1943 Dr. Jeffries was awarded the Gold Medal of the A.S.M., recognizing his outstanding metallurgical knowledge and mature ability in the diagnosis and solution of diversified metallurgical problems. He is an elected member of the National Academy of Sciences, and served as chairman of the Metals Conservation and Substitution Group, National Research Council, National Academy of Sciences of the War Production Board. He is a co-author of the book "The Science of Metals", published in 1924, and co-author and author of numerous books and articles. Since his retirement in 1950 from General Electric, Dr. Jeffries has been the Leonard Case Lecturer at Case Institute of Technology.

Summing up the character of the man personally we use the words of his friend, Samuel L. Hoyt: "However met, Zay is a splendid humanitarian, a completely friendly spirit, and a benevolent guide to his fellow men. His greatest satisfaction comes from the knowledge that he has helped in life. In private or in public he gives freely of himself and his human qualities stand out for all who will perceive. He does not seek material reward, but gives because it is his spirit to give".

Metals of Future Outlined at Rockford

C. Roger Sutton, International Nickel Co., Inc., Spoke on "Metals of the Future" at a Meeting Held in Rockford. Shown are, from left: C. Nivinski, entertainment chairman; Mr. Sutton; and Quentin Bowen, Jr., vice-chairman

Speaker: C. Roger Sutton

International Nickel Co., Inc.

"Metals of the Future" were described by C. Roger Sutton, International Nickel Co., Inc., at a meeting of the **Rockford Chapter.**

There are three major fields of development which will determine the use of metals in the future—energy production, transportation and communications. Mr. Sutton's talk was concerned principally with the energy production for nuclear power. There are presently four sources of energy —fossil fuel (oil and coal), solar energy, fission energy and fusion energy. Using 'Q' units as a measure of the quantity available, the energy from these sources and the time of known reserves are as follows:

Fossil fuel	20-50 years	0.010-0.100 Q
Solar energy	1 Q	10^{14} years
Fission energy	2.0-10.0 Q	200 years
Fusion energy	10^6 Q	Indefinite

Fusion is still part of the future whereas fission is already here. In the fission process, uranium^{235} breaks down to form odd number isotopes, and these isotopes fission very rapidly. A slide of a schematic drawing of the chain reaction was shown.

Mr. Sutton then showed slides of reactors and their construction. Used as moderators are hydrogen, heavy water, helium, lithium, beryllium, boron and carbon. Used as cladding materials are aluminum, zirconium and stainless steels.

Slides were also shown of the core vessel fabrication and construction. The core vessels were originally welded in a dry box, but today they are arc welded with consumable electrodes under an inert gas shield.

Some of the problems found in the production of fission energy are welding, reprocessing of used metals, galling and wear. Mr. Sutton noted that there are very few materials for high-temperature uses. The metals used in supersonic flight applications are magnesium alloys, titanium and its alloys, chromium-nickel-molybdenum steels and nickel-base precipitation hardening alloys. Also finding use are cermets such as nickel-titanium carbide, molybdenum disilicide and chrome-alumina.

New superalloys with additional strength will be developed. Based on high-temperature creep properties, Mr. Sutton noted that these alloys will be of chromium-cobalt-nickel type.

In closing, Mr. Sutton pointed out that iron will definitely be a metal of the future. Other metals to find considerable use will be cobalt, nickel, chromium, copper and magnesium. —**Reported by Joseph F. Sisti for Rockford Chapter.**

As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the A.S.M. collected, edited, published and distributed over *one hundred million pages* of metallurgical information.

Discusses Vacuum Melting Techniques

From Left: R. Goff, Chairman, A. M. Aksoy, Vacuum Metals Corp., Bob Oakley, Past Chairman, and Joe Marx, Secretary, Are Shown at a Meeting of Texas Chapter Where Mr. Aksoy Spoke on "Vacuum Melting Techniques"

Speaker: A. M. Aksoy
Vacuum Metals Corp.

A. M. Aksoy, chief metallurgist, Vacuum Metals Corp., spoke on "Vacuum Melting Techniques" at a meeting of the **Texas Chapter.**

Dr. Aksoy opened his talk by commenting on the increased demand upon metallurgy posed by aircraft, guided missiles, electronics and nuclear activities. Improved properties such as better strength at high temperature, good ductility and impact, and cleaner steels, are becoming a necessity. This has started the search for special techniques, such as the vacuum technique in melting.

Historically, Edward Colby obtained the first patent on vacuum induction melting 65 years ago. The process remained on the laboratory scale until 1923, when in Germany the first commercial furnace was able to melt up to five metric tons under the low vacuum of a few millimeters. World War II was the real beginning of commercial vacuum practice. This was brought about by replacement of mercury by oil, better seals, improved leak detecting devices, and better mechanical and electrical systems for translational and rotational motion. Pressures now obtained are as low as one micron for large-scale operations.

There are presently several commercial vacuum melting processes. The process is important as the results differ. The three most common are vacuum degassing, vacuum arc remelting and vacuum induction melting. Vacuum degassing consists of melting the steel by any method, pouring it into a ladle and reladling it in a vacuum chamber. There are several varieties of this process and heats as large as 150 tons have been poured in Germany. The product is relatively free from hydrogen, has a small amount of blow holes and has better hot working properties. It is also used for nonferrous metals such as aluminum and copper.

Vacuum arc remelting has been used in the production of reactive metals such as titanium and zirconium. An electrode prepared by a suitable method is melted in a vacuum with progressive solidification from bottom to top. The crucible is a water-cooled copper mold. The product of this process is relatively free from segregations and, as a result, it has recently been applied to the production of high-temperature alloys and steels.

Vacuum induction melting is similar to air induction melting except that it happens in a vacuum. Both melting and pouring of ingots take place in a vacuum and the operation is carried out on a semicontinuous basis. This process allows the greatest degree of refinement.

Dr. Aksoy discussed in detail, with the aid of slides, the properties improved by vacuum induction melting. The major purposes of vacuum melting are (a) to lower gas content, (b) to lower inclusion content, (c) to control composition closely and (d) to produce alloys containing larger amounts of reactive elements, such as titanium and aluminum, than possible by conventional techniques. The first three permit us to improve stress rupture, fatigue impact and tensile properties of contemporary production alloys; the last one takes us off into virgin territory in alloy development and new applications.—**Reported by R. C. Anderson for Texas Chapter.**

—Metals for Mankind—

Announces News Digest

Editorial features in the current issue of ***Metal Progress*** are interpreted and highlighted in "Metals Engineer", a news digest issued by the American Society for Metals. "Metals Engineer" will cover the highlights of each issue, tell what's coming next month, and present some of the important activities of the Society. It is mailed three days prior to mailing date of the current issue of ***Metal Progress.***

Copies are available upon request from Metal Progress, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

TECHNICAL PROGRAMS

39th National Metal Congress
and
2nd World Metallurgical Congress

The complete technical programs of the American Society for Metals, the 2nd World Metallurgical Congress and all participating societies will appear in the October issues of METAL PROGRESS and METAL SHOWMAN, both of which will be sent to the total membership of the American Society for Metals, and Conferees in the W.M.C., well before the Congresses convene in Chicago in November.

Quarterly Preprint List

Order Papers by Number
Address Requests to:
Box PP, A. S. M.
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All of the following papers will be preprinted for distribution to members of the American Society for Metals upon request. The Society will print only 10% in excess of the number of orders for preprints in the office on press date, and this excess 10% will be sent out as long as it lasts. Order the papers by their numbers.

The preprints listed represent the third quarterly preprinting of papers accepted by the Transactions Committee for inclusion in the annual volume of the Transactions of the Society. Notice of the second quarterly preprinting appeared in August 1957.

57. Cleavage Step Formation in Brittle Fracture Propagation, by J. M. Berry, Metallurgy and Ceramics Research Dept., General Electric Co. Research Laboratory, Schenectady, N. Y.

Single crystals of silicon-iron were cleaved in the [110] direction at −196° C. by driving a wedge into the base of a very fine sawed notch. In several instances such a fracture was stopped and the extremely fine crack utilized to restart the fracture at +25° C.; there seemed to be no qualitative difference between fractures propagated at the different temperatures. Shapes of individual fracture markings (cleavage steps) were determined by examination of the fracture surface (001) and the profile of the fracture surface (110). The cleavage steps were relatively large near the base of the sawed notch and became progressively relatively smaller as the distance from the notch increased. Most of the identifiable cleavage steps had traces on the fracture surface and certain geometric cross sections which indicated that these cleavage steps had been generated by local cleavage at large but specific crystallographic angles to the main cleavage plane (001). The local cleavages, forming "brittle" cleavage steps, occurred on either secondary (100)-type cleavage planes normal to the main cleavage plane or on planes parallel to (211)-type planes, if, and only if, these planes were interfaces between a twin and the parent crystal. These steps appear to be formed by the propagation of cleavage occurring on adjacent (100)-type planes. Since no clear evidence of fracture initiation was observed on the brittle cleavage steps, the role of plastic deformation in their formation is believed to be restricted to the creation of a different type of cleavage plane, the (211)-type, when it is a twin-parent crystal interface. However, there is presumptive evidence of the presence of many relatively small "non-crystallographic" or "ductile" cleavage steps, and plastic deformation must have had a dominent role in their formation.

58. Microstructure and Mechanical Properties of the Eutectoid Ti-Cu-Al and Ti-Cu-Al-Sn Alloys, by R. F. Bunshah and H. Margolin, Research Division, New York University, College of Engineering, New York, N. Y.

Time-temperature-transformation diagrams and mechanical properties have been studied for active eutectoid Ti-Cu-Al and Ti-Cu-Al-Sn alloys. The best combination of properties is obtained for the Ti-5Cu-3Al-2Sn and Ti-8Cu-3Al-2Sn alloys. Microstructural correlations of the mechanical properties are presented, from which means to avoid brittleness are deduced. The results show promise for the development of stable alpha + compound titanium alloys.

59. Unique Deformation and Aging Characteristics of Certain Magnesium-Base Alloys, by S. L. Couling, J. F. Pashak and L. Sturkey, Physical Metallurgy Section, Metallurgical Laboratory, Dow Chemical Co., Midland, Mich.

Certain magnesium alloys exhibit unlimited cold rollability. A plot of per cent rolling reduction versus tensile yield strength for these alloys shows the yield strength to reach a maximum at about 15% reduction, and to decrease progressively from this point on with increasing reductions. Aging the cold rolled material at a low temperature raises the yield strength; the greater the rolling reduction, the higher the yield strength on subsequent aging. The deformation mechanism operative in these alloys which accounts for their unusual property variations is described and the probable aging mechanism discussed.

60. The Response of an Iron-Base Alloy, Hardened With Titanium, to Various Aging Times and Temperatures, by T. W. Eichelberger, Metallurgy Dept., Westinghouse Electric Corp. Research Laboratories, Pittsburgh, Pa.

A study was made of the effect of titanium, molybdenum and vanadium on the age hardening characteristics of a commercial Ni-Cr-Fe alloy. The base composition was 25% Ni, 14% Cr, 1.25% Mn, and the balance Fe, except for the usual impurities and as noted above. The aging temperature was varied from 1100 to 1600° F. and the effect of aging time was studied from 1 to 512 hr. Master curves are plotted giving hardness as a function of time, temperature and composition, the maximum hardness obtainable as a function of temperature and composition, and the time to reach maximum hardness as a function of temperature.

61. Temperature and Rate Dependence of Strain Hardening in the Aluminum Alloy 2024-0, by D. S. Fields, Research Metallurgist, Aluminum Co. of America, New Kensington, Pa., and W. A. Backofen, Assistant Professor of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

The strain hardening characteristics of the aluminum alloy 2024-0 have been studied over a range of constant shear-strain rates from 0.06 to 24 per min., and at temperatures from −195 to 500° C. Generally high rates of strain hardening are found at the low temperatures. Little or no strain hardening occurs at the higher temperatures. At intermediate temperatures, the shape of the stress-strain curve is strongly dependent upon strain rate. Temperature dependence of the flow stress and of the strain-rate sensitivity at fixed strains is low in the

temperature range from 28 to 200° C. because of strain aging during deformation. Correlations of temperatures and strain rate for fixed levels of flow stress, using the Zener-Hollomon parameter, are obscured by the strain aging.

62. Effect of Copper on the Heat Treating Characteristics of Medium-Carbon Steel, by R. A. Grange, Edgar C. Bain Laboratory, U. S. Steel Corp., Monroeville, Pa., V. E. Lambert, Westinghouse Lamp Division, Bloomfield, N. J., and J. J. Harrington, Steel Works, U. S. Steel Corp., Gary, Ind.

The effect of up to 1.5% copper on hardenability, isothermal transformation, equilibrium transformation temperatures, temperature range of martensite formation, softening of martensite on tempering, and precipitation hardening was determined for a 0.45% carbon steel containing graded amounts of copper.

63. Preparation of Uranium and Uranium Alloy Powder Metal Compacts, by Herbert S. Kalish, Engineering Manager, Metal Fabrication and Assembly, Sylvania-Corning Nuclear Corp., Bayside, L. I., N. Y.

Methods for the preparation of uranium powder suitable for powder metallurgy fabrication. Most of the powder metallurgy uranium and uranium alloy parts fabricated in the United States have been made from vacuum decomposed uranium hydride powder. Uranium parts have been made by cold pressing and sintering, hot pressing and powder rolling, and these processes are briefly evaluated.

Hot pressing appears to be the most favorable process for unalloyed uranium, yielding fine grain size, random orientation uranium parts, and is amenable to the fabrication of slugs and hollow cylinders.

Cold pressing and sintering appear to be the most promising approach for making uranium alloy parts, although powder rolling, hot pressing and powder extrusion are distinct possibilities for certain special shapes that might be required.

The best binary uranium alloys are those containing 1 to 4% molybdenum, 1 to 4% columbium or 2% zirconium. Ternary and more complex alloys can also be made by powder metallurgy. Uranium alloy parts which have been made include cylindrical slugs, long cylinders and a complex 91-hole wafer.

64. High-Temperature Oxidation and Contamination of Columbium, by William D. Klopp, Chester T. Sims and Robert I. Jaffee, Battelle Memorial Institute, Columbus, Ohio.

The oxidation and contamination rates of columbium in oxygen and in air were measured in the temperature range 600 to 1200° C. The oxidation curves in oxygen were linear and the rate constants were correlated by an Arrhenius-type plot. The heat of reaction was 5410 cal per mole from 600 to 1100° C.; above 1100° C. the reactions were rapid and the rates could not be correlated to the Arrhenius-type plot. The activation energy for diffusion of oxygen in columbium was calculated from contamination data. Weight-change curves of columbium in air were also linear, with lower rates than in oxygen. The heat of reaction was, from the reaction rate data, 10,100 cal per mole from 600 to 1200° C. Contamination in air-reacted columbium was similar to that in oxygen-reacted columbium, suggesting that oxygen is the primary diffusing contaminant.

65. Effect of Grain Size and Carbon Content on the Yield Delay-Time of Mild Steel, by Joseph M. Krafft, Physicist, and A. M. Sullivan, Metallurgist, Ballistics Branch, Mechanics Division, U. S. Naval Research Laboratory, Washington, D. C.

The delay time for onset of gross yield after sudden application of constant stress has been measured for mild steels of varied carbon content and grain size. The delayed yield is thought to provide a measure of the upper yield point sufficiently exact to permit a separation of the effects of some of the principal metallurgical parameters upon it. The results indicate that the size and number of pearlite patches have a more direct influence on the stress supported for a given delay time, or upper yield strength, than does the grain size. The grain size, or possibly the path in ferrite between pearlite patches, does appear to dominate the flow stress at given strain rate, or lower yield strength, as expected from earlier works.

66. Magnetic Analysis of Phase Changes Produced in Tempering a High-Carbon Steel, by Morris Mentser, Physical Chemist, Special Coal Research Section, Branch of Bituminous Coal, U. S. Dept. of the Interior, Bureau of Mines, Pittsburgh, Pa.

A magnetic analysis was made of the carbide phases produced during tempering of a quench hardened, high-carbon steel. Hexagonal close-packed iron carbide was identified magnetically by a direct determination of its characteristic point of inflection at approximately 380° C. Hexagonal carbide is known to be formed upon decomposition of martensite in the first stage of tempering. The present study showed that hexagonal carbide forms initially upon decomposition of retained austenite in the second stage of tempering, at 230° C. or lower. Thus, at these temperatures, bainite, the transformation product of retained austenite, is initially an aggregate of ferrite and hexagonal carbide. The same sequence of carbide transformation occurs in tempering martensite and retained austenite, even though the temperature ranges of the respective stages of tempering overlap only partially. The composition of hexagonal carbide, derived from magnetic measurements, was approximately $Fe_{2.5}C$.

Transformation of hexagonal carbide into cementite occurs largely in the third stage of tempering. The hexagonal carbide formed upon tempering of steel appears to be more stable than that formed in iron catalysts by carburizing gases. No evidence was found for the intermediate formation of Hagg iron carbide during third-stage tempering of the steel that was studied.

67. Subaquatic Casting of Aluminum Ingots, by Ichiji Obinata, The Research Institute for Iron, Steel and Other Metals, Tohoku University, Sendai, Japan, and Hiroshi Tanaka, Dr. Furukawa Electric Works, Nikko Copper Refinery, Nikko, Japan.

As a result of observations of the process of solidification of molten aluminum droplets in water, a method of making ingots by casting molten aluminum and its alloys in thin-walled metal molds set in hot water has been introduced by the writers and the method is called the SAC process.

It is shown that by this SAC process sound ingots of fine and homogeneous equiaxed structure are obtained. While there exists no marked difference between SAC and chill ingots in the physical and chemical properties, the mechanical properties of the former are somewhat superior to those of the latter.

By subaquatic continuous casting method, SACC, cylindrical 2S ingots of practical size have been obtained and their macrostructures are compared with those of ordinary continuous casting ingots.

68. Corrosion, Pyrophoricity and Stress Corrosion Cracking of Titanium Alloys in Fuming Nitric Acid, by John B. Rittenhouse, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.

The corrosion, pyrophoric reactions and stress-corrosion cracking of pure titanium and the titanium alloy containing 8% manganese resulting from storage in fuming nitric acid (FNA) were studied.

It was shown that the tendency toward ignition sensitivity depended upon there being present on the metal surface with FNA a dark coating, which was identified as finely divided titanium metal. The extent of the dark

(Continued on p. 8)

Quarterly Preprint List-Continued

coating, the corrosion rates and the incidence of pyrophoric reactions increased with increasing NO_2 and decreased with increasing H_2O content of the ternary system HNO_3-NO_2-N_2O.

Stress-corrosion cracking of hoop-test samples of commercially pure titanium occurred with greater than 6.5% NO_2 and less than 0.7% H_2O in the FNA; however, the stress-corrosion cracking of the 8% manganese alloy occurred with greater than 0% NO_2 and less than 0.8% H_2O concentrations in the FNA.

The corrosion-time relationships of two titanium alloys and iodide titanium in anhydrous FNA (20% NO_2) over a temperature range from 25 to 71° C. were determined. Results of metallographic examinations of the corroded samples to ascertain the corrosion mechanism and the effects of metallurgical history of the samples on the corrosion behavior are discussed.

Chemical and X-ray diffraction analyses of the alloys, the FNA used, and the corrosion products developed are reported.

69. Temperature and Stress Dependence of the Atmosphere Effect on Nichrome V, by Paul Shahinian and M. R. Achter, High-Temperature Alloys Branch, Metallurgy Division, U. S. Naval Research Laboratory, Washington, D. C.

Creep rupture tests have been performed in vacuum and air on Nichrome V, a nickel-chromium alloy, at 1100, 1300, 1500, 1700 and 1900° F. at a range of stresses. While the alloy tends to be stronger in air than vacuum at high temperatures and low strain rates, the reverse is true at low temperatures and high strain rates. At stresses where the vacuum specimen has a longer rupture life, the creep rate of the air specimen may be lower at the start of the test but faster subsequently. A possible mechanism to explain these reversals involving two competing processes is considered. Comparisons of the atmosphere effect on Nichrome and nickel are in accord with the difference in oxidation resistance.

70. Studies of the Oxidation and Contamination Resistance of Binary Columbium Alloys, by Chester T. Sims, William D. Klopp and Robert I. Jaffee, Battelle Memorial Institute, Columbus, Ohio.

A study of the effects of binary alloying additions on the oxidation and contamination resistance of columbium has been conducted. The alloys contained up to 35 atm. % titanium, chromium and zirconium, 25 atm. % vanadium, molybdenum, tantalum and tungsten, and 5 atm. % beryllium, boron, cobalt, iron, manganese, nickel and silicon. The oxidation and contamination studies were conducted in air at 600, 800 and 1000° C.

Four elements, titanium, vanadium, molybdenum and chromium, improved oxidation resistance. The concentrations for optimum oxidation resistance at 1000° C. were 25 atm. % titanium, 10 atm. % vanadium, 5 atm. % molybdenum and 15 atm. % chromium. Titanium was most effective in reducing the rate of oxidation; at 600 to 1000° C., the columbium-25 atm. % titanium alloy oxidized 1/10 to 1/20 as rapidly as pure columbium.

Contamination was investigated by hardness-penetration measurements on all oxidized alloys except those containing beryllium or boron. Zirconium and titanium markedly reduced the depth of oxygen contamination resulting from exposure to air. Diffusion coefficients for oxygen in the columbium binary alloys were calculated and related by activation-energy plots where possible. Zirconium, titanium, chromium and vanadium were most effective in reducing oxygen diffusion into columbium.

71. Phase Relationships in the Fe-Cr-Ni-N System, by G. F. Tisinai and C. H. Samans, Engineering Research Dept., Standard Oil Co., Whiting, Ind.

The austenite-austenite plus ferrite limits in the iron-chromium-nickel-nitrogen system have been defined, in the range 21 to 33% chromium with up to about 1% nitrogen and 20% nickel, by a study of 82 alloys, 59 of which were prepared by powder metallurgy methods. These boundaries, at 2200° F., are straight lines with an equivalence of 0.025% nitrogen for 1% nickel independent of chromium content, but, as the chromium content is increased, more nitrogen (and/or nickel) must be added to produce a completely austenitic alloy. Phase field boundaries, somewhat more complicated, also are given for 2000° F. The effects of nominal carbon levels of 0.05 and 0.20% have been evaluated to a limited extent. Surface effects because of nitrogen diffusion were noted in temperature gradient bar studies which make this method unsatisfactory for use. Changes in the annealed microstructure, during heat treatments at temperatures down to 1300° F., were followed metallographically and by X-ray studies of ferric chloride residues. As a result of nitride precipitation, both martensite and ferrite formed at the lower temperatures. Sigma phase was detected only in the 33% chromium alloys at temperatures below 1600 to 1700° F., depending on the carbon content.

IMPORTANT MEETINGS *for November*

Nov. 1-3—Metal Treating Institute. Annual Meeting, Sheraton Hotel, Chicago. (C. E. Herington, Executive Secretary M.T.I., 271 North Ave., New Rochelle, N. Y.)

Nov. 2-8—American Society for Metals. Annual Meeting, Palmer House, Chicago; National Metal Exposition & Congress. International Amphitheatre, Chicago. (W. H. Eisenman, Director, 7301 Euclid Ave., Cleveland 3.)

Nov. 4-6—American Institute of Electrical Engineers. Annual Machine Tool Conference, Hotel Schroeder, Milwaukee, Wis. (Harry Akeney, General Chairman, A.I.E.E., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.)

Nov. 4-6—American Institute of Mining, Metallurgical, and Petroleum Engineers. Institute of Metals Division Meeting, Morrison Hotel, Chicago. (E. O. Kirkendall, Secretary A.I.M.E., 29 W. 39th St., New York 18.)

Nov. 4-8—Society for Nondestructive Testing. Fall Technical and Annual Meeting, Morrison Hotel, Chicago. (Philip D. Johnson, Secretary S.N.T., 1109 Hinman Ave., Evanston, Ill.)

Nov. 6-8—Grinding Wheel Institute and Abrasive Grain Association. Annual Meeting, Sheraton-Blackstone Hotel, Chicago. (Hunter Thomas Associates, 2130 Keith Bldg., Cleveland 15.)

Nov. 6-8—Scientific Apparatus Makers Association. Midyear Meeting of Laboratory Apparatus and Optical Sections, Edgewater Beach Hotel, Chicago. (Robert E. Ohaus, Committee Chairman S.A.M.A., Ohaus Scale Corp., Union, N. J.)

Nov. 13, 14 and 15—American Standards Association. Annual Meeting, St. Francis Hotel, San Francisco. (G. F. Hussey, Jr., Secretary, A.S.A., 70 E. 45th St., New York 17, N. Y.)

Nov. 18-22—Gaillard Seminar on Industrial Standardization. St. Francis Hotel, San Francisco. (John Gaillard, Box 273, Route 1, Briarcliff Manor, N. Y.)

Nov. 19-21—Investment Casting Institute. Annual Fall Meeting, Sheraton Hotel, Chicago. (Peter Schipper, Director, I.C.I., 27 E. Monroe St., Chicago 3, Ill.)

Nov. 18-21 — American Institute of Electrical Engineers. Conference on Magnesium and Magnetic Materials, Sheraton-Park Hotel, Washington, D. C. (Louis R. Maxwell, Local Chairman, U. S. Naval Ordnance Laboratory, White Oak, Silver Spring, Md.)

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Simplified Production—The use of titanium, chromium, zirconium and other easily oxidized metals has been hampered by the high cost of producing sufficiently pure, ductile metals. In a new process, developed by Lucio F. Mondolfo, director of metallurgical engineering, Illinois Institute of Technology, the oxides of the metals to be produced are reacted with aluminum under such conditions that complete removal of oxygen is accomplished.

Ultrasonics Venture Debuts—An organization headed up by Paul M. Platzman, a specialist in ultrasonics, will produce ultrasonic cleaning machines and metalworking equipment. Located in Mineola, Long Island, the outfit will offer research and development services to keep working industries informed of advances in theory and apparatus.

New Alloys—Mallory-Sharon has developed a titanium sheet alloy, MST 2.5A1-16V, which can be used for parts requiring severe forming and can be heat treated to high strength, and a weldable sheet and bar material, MST-821, with exceptional high-temperature strength.

Hardness Testers—Fully automatic Rockwell hardness testers which use tiny photo transistors and intricate timing mechanisms and are capable of testing the hardness of both ferrous and nonferrous metals in hard or soft condition at the rate of 1000 parts per hour have been developed by Wilson Mechanical Instrument Division of American Chain & Cable Co., Inc.

Aluminum for High Temperatures—Powder aluminum products which can withstand 900° F. temperatures may be possible as a result of aluminum powder metallurgy products recently announced by Alcoa.

Stainless for Aircraft—Armco Steel Corp. has announced the development of a high-strength stainless steel that will permit future aircraft and missiles to streak across the sky faster without suffering damage due to intense air friction heat. Named PH 15-7 Mo, its outstanding characteristics are assured production in volume, ease of fabrication and corrosion resistance. It is made in conventional electric furnaces and rolled on continuous strip mills.

Pilots to See—Sierracin Corp. has solved the problem of "fog" in the cockpit by developing a transparent, infrared coating for plastics and glass. Sierracote, a vaporized, essentially metallized coating, is applied by a high-vacuum coater manufactured by Consolidated Electrodynamics' Rochester Division to any type of plastic used for windows and canopies in aircraft.

Symposium in India—In cooperation with the Indian Institute of Foundrymen, the National Metallurgical Laboratory Council of Scientific and Industrial Research, India, is sponsoring a symposium on "Recent Developments in Foundry Technology", to be held Feb. 5-8, 1958.

Radiation Control—Controls for Radiation, Inc., a company which will provide a service covering the radiation safety and hazards control aspects of the nuclear industry has been organized in Cambridge, Mass.

Strain Gage Meeting—The Naval Air Material Center will hold a symposium on "Elevated Temperature Strain Gages" Dec. 4-6 at the Aeronautical Structures Laboratory in Philadelphia.

Forum—On Nov. 6-8, the Porcelain Enamel Institute will conduct its annual forum on "Improved Processing and Control Methods" at Ohio State University in Columbus.

Add to University—The University of Minnesota is constructing quarters, to be completed by the fall of 1958, for its department of metallurgy and mineral engineering, on a modular basis so that all laboratory facilities will be available every ten feet. M. E. Nicholson, vice-chairman of the Minnesota Chapter, heads the department of metallurgy.

Arc-Image Furnace—In connection with high-temperature studies at the research laboratories of National Carbon Co., an arc-image furnace has been developed which produces temperatures approaching that of the sun's surface with ordinary motion picture projection equipment. Highly polished curved mirrors concentrate rays from a carbon arc into a small but extremely high-energy beam that can produce temperatures above 7000° F.

Very High Temperature—Using ozone instead of oxygen, Temple University, Philadelphia, has produced flame near the heat of the sun's surface for testing high-temperature materials.

Magnetic Four Ways—General Electric Research Labortory in Schenectady, N. Y., has developed a sheet material which can be easily magnetized in four directions. In many types of electrical equipment this will reduce noise and loss of energy.

First Report—While working with lithium fluoride crystals in recent experiments scientists at General Electric's Knolls Atomic Power Laboratory observed brilliantly colored, microscopic square bubbles. They have been unable, however, to suggest a practical use for them.

Blind to Read — On the drawing boards at Battelle Memorial Institute is an electronic instrument which will enable the blind to "read" standard printed words. When completed the instrument, described as an "audible reading machine", will be small enough to hold in the hand.

Warning — A small transistorized meter is being marketed by Universal Transistor Products Corp. to warn personnel working with radioactive materials when there is too much alpha and beta radiation. Two flashlight batteries will operate it for 150 hr.

Testing Machine—A 12,000-lb. creep rupture testing machine that can be banked and run at the same load by a hydraulic load maintainer has been introduced by Tatnall Measuring Systems Co. Called Model RH-12, it has a 1800° F. split furnace, sealed at the bottom to prevent stack effect, and three heat elements with shunts to provide uniform temperature along the gage length.

Better Adhesive — Bell Telephone Laboratories report that an adhesive many times stronger than any currently used, now, for the first time, makes is possible to satisfactorily join polyethylene directly to rubber, brass or brass-plated metals.

Meet Your Chapter Chairman

DELAWARE VALLEY

W. F. HIPPLE, assistant sales manager, Ajax Electrotherm Corp., Trenton, N. J., was born in Center County, Pa. He received his B.S. degree in metallurgy from Penn State. Besides being a charter member and the first chairman of the Delaware Valley Chapter A.S.M., Mr. Hipple is also a member of the Engineers Club of Trenton.

His three children, Billy, Connie and Betsy, along with hunting and other sports, keep Mr. Hipple busy in his spare time. He served as a captain in the U. S. Air Force during World War II.

CANTON-MASSILLON

G. BRAINARD TRUMBLE, manager of the chemical and metallurgical engineering department, Canton forge plant, chassis parts division, Ford Motor Co., was born in Lansing, Mich. His technical education came through special metallurgical courses from Michigan State, Wayne and Purdue University.

His first 18 years of work were spent at the Atlas Drop Forge Co., where he progressed through their laboratories to the position of chief metallurgist. The next two years were spent as plant metallurgist for Tube Turns, Inc., in Louisville, Ky.

Mr. Trumble became associated with Ford Motor Co. as a production heat treat superintendent in 1947 at the forge plant in Canton, and in a similar capacity during the reactivation of Ford's Chicago aircraft division forge plant. He returned to his present position in 1952.

Mr. Trumble has been very active in the Canton-Massillon Chapter, having served as chairman of numerous committees, treasurer and vice-chairman. His personal interests are people and community activities. He has two children, and his greatest pride, six grandchildren.

NORTH TEXAS

ALBERT S. HOLBERT attended North Texas State College at Denton and Texas College of Mines, a branch of the University of Texas, at El Paso, where he received his B.S. degree in mining and metallurgical engineering.

From 1949 to 1950 he was employed in the metallurgical department at Sheffield Steel in Houston, and, in December 1950 he accepted employment with Continental Emsco Co., a Division of Youngstown Sheet and Tube, where he is now employed as plant metallurgist in Garland, Tex.

OREGON

THEODORE B. MATHISEN, sales manager in the Pacific Northwest district for U. S. Steel supply division, is a native of Oregon.

He was born in Seaside along the coast and completed secondary education in Portland schools. His Oregon residence was broken in World War II when he served four years with the Marine Corps, 32 months of which was spent in the South Pacific area of operations.

Ted was in the hotel business before entering the steel industry with Pacific Machinery & Tool Steel Co. of Portland. He joined U. S. Steel's supply division after World War II, and has advanced from salesman to the present post of manager in stainless and tubing sales for the Pacific Northwest district.

He is married and has four children, and is actively interested in golf, fishing and hunting.

SAN DIEGO

GEORGE D. CREMER, senior staff engineer, Solar Aircraft Co., has a background of many years experience in powder metallurgy and ceramics, including time spent at Manhattan Project, Los Alamos and Oak Ridge National Laboratory. He acquired his B.S. degree in engineering at Massachusetts Institute of Technology, and is a member of the American Rocket Society and the Institute of Aeronautical Sciences as well as A.S.M.

To quote a fellow member, "his dynamic personality, unswerving devotion to A.S.M. and his ability to unerringly select interesting program topics has made him indispensable to the San Diego Chapter. Through his capable leadership we are looking forward to a rewarding year that will see the further growth and influence of A.S.M. in the San Diego area."

George and his wife Billie have four daughters, JoAnne 14, Darcy 11, Valerie 8, Michele 3, and a son, Randy, who is 13. His recreational interests include sailing, skin diving, water skiing and photography.

DES MOINES

O. NORMAN CARLSON, associate professor, Iowa State College, is from South Dakota. He holds an A.B. degree from Yankton College of that state and a Ph.D. degree in physical chemistry from Iowa State. In 1944 he went to Iowa State as a chemist, becoming assistant professor, and in 1954 associate professor. He maintains membership in the A.C.S., A.I.M.E., Lions Club and is an active member of his church. He has been a member of the executive committee and vice-chairman of the Des Moines Chapter.

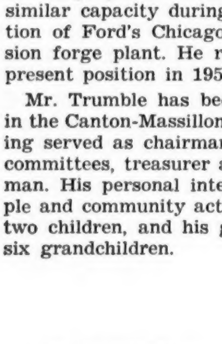
Mr. Carlson plays golf occasionally and is an ardent baseball fan. A good bit of his time this past summer has been devoted to coaching his sons Gregg and Richard, age 9 and 8, in his favorite sport, and a mutual friend tells us that "he frightens the birds and rabbits each fall with his shotgun." Little Karen, age 6, is the youngest member of his family.

BRITISH COLUMBIA

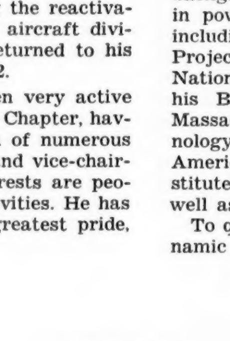
JOHN W. BOOTH, vice-president of Boyles Bros. Drilling Co. Ltd., was educated in England in mechanical engineering. He is a family man with two children and mountaineer without time to follow his chosen sport.

John has been membership chairman, treasurer and vice-chairman in A.S.M. and is active in the A.S.M.E. and S.A.E. Under his capable and conscientious leadership, British Columbia is looking forward to another interesting year of promoting the objectives of A.S.M.

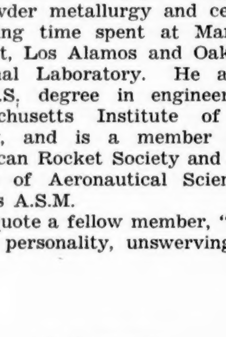
W. F. Hipple



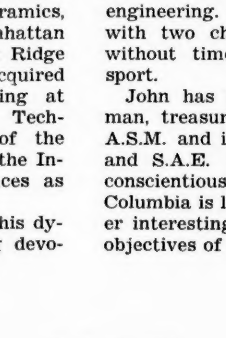
A. S. Holbert



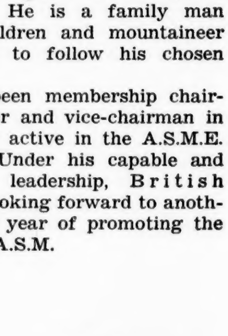
T. B. Mathisen



G. B. Trumble



G. D. Cremer



MEN OF METAL

George A. Lennox, vice-president and director of sales, Driver-Harris Co., has been elected to the board of directors.

John M. Welch has joined Olin Mathieson Chemical Corp. as Chicago regional sales manager.

Louis R. Wanner has been appointed manufacturing manager in charge of plastics, metal base, assembly and formatic operations for Sylvania Electric Products Inc.

William A. Cook, member of the board of directors, has been elected president of the Phoenix Iron & Steel Co. **John A. K. Sisto** was appointed vice-president and executive assistant, **Daniel Eberstein** was elected secretary.

Ralph A. Petersen has been appointed manager of the new Birmingham, Ala., district office of Pangborn Corp.

David S. Frankel is now manager of central district sales and field engineering for Machlett Laboratories, Inc.

Charles A. Mueller, after several years of engineering and metallurgical work in Utah and California, returns to Lindberg Engineering Co., Chicago, as chief engineer of the new Gas Process Division, to handle the development of atmosphere gas generation processes for heat treating.

James B. Reid has been appointed magnesium sales manager of Dow Chemical's New York office territory. **E. H. Killheffer** is now head of the Buffalo sales office and **Robert M. Keil** is magnesium sales manager in the Camden, N. J., office.

Tatnall Measuring Systems Co., has appointed **Clyde T. Moyer** district sales engineer to cover the Middle Atlantic States and the District of Columbia, and **Joseph K. Strickland** to cover New York, New England and Northern New Jersey.

John W. Bolton, retired after 28 years with Lunkenheimer, was presented, in absentia, A.S.T.M.'s Award of Merit at the "Awards Luncheon" held recently in Atlantic City.

Don Palmisano has been named customer sales representative for the Kansas City, Mo., office of the Electrode Division, Great Lakes Carbon Corp.

Gas Machinery Co. Cleveland, has announced the appointment of **Carl C. Knierim** as manager of heat treat sales.

Olin Mathieson Chemical Corp., has appointed **Sam Gurley, Jr.**, vice-president of sales for Olin Aluminum. He will be responsible for sales, advertising and promotional activities.

E. M. Kipp has joined Foote Mineral Co. as director of research of the research and development department at Berwyn, Pa.

George D. Lawrence has been promoted to chief engineer, electric furnaces, for U. S. Steel's American Bridge Division.

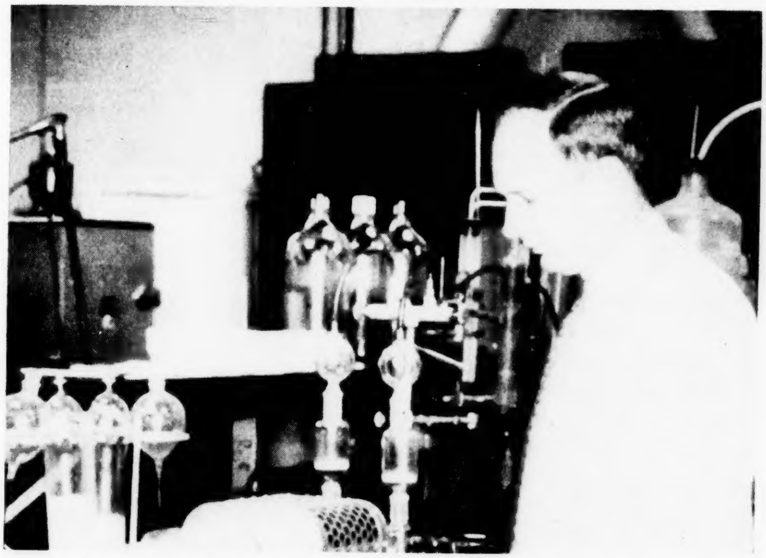
James A. Downey Co., Baltimore, for many years sales representative for Washington Steel Corp.. is taking on the Southeastern district and will establish headquarters in Atlanta to cover the new territory.

Lynwood O. Eikrem, project engineer at Baird-Atomic, Inc., has been elected president of the New England Spectroscopic Society.

R. F. Mallina, inventor and authority on the solderless wrap connection, joins Gardner-Denver Co. as research consultant. He will concentrate his efforts on the commercial application of this connection.

Julian C. Hill, formerly Florida district manager for Revere Copper and Brass, is now regional sales representative for the United Wire & Supply Corp. He will cover Alabama, Georgia and Florida.

M. E. I.'s 100th Student at Work



Philip G. Jackson, Production Materials Tester With the Allison Division, General Motors Corp., Indianapolis, Was Featured Last Month in Metals Review as the 100th Student of the Metals Engineering Institute, the In-Plant Training and Home Study Correspondence School of the American Society for Metals. During the brief time since that story, M. I. E. enrollment has zoomed to well over 300 students. Mr. Jackson is shown at work

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☐ Electroplating and Metal Finishing
☐ Primary and Secondary Recovery of Lead and Zinc
☐ Steel Plant Processes

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research,
Western Reserve University, Cleveland,
With the Cooperation of the John Crerar Library, Chicago.

Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts*.

A General Metallurgy

362-A. Reporting and Analyzing Production in a Swedish Steel Plant. C. Jan Yngstrom. *American Society for Quality Control, National Convention Transactions,* May 1957, p. 549-558.

Reporting routines employed at Domnarfvet Iron & Steel Works. Products include hot rolled plate, rails and beams, sections, rods and strips. Decentralized production reporting found more efficient than centralized reporting. (A5d; ST)

363-A. Lanthanum. L. Sanderson. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 111-112. (CMA)

Physical and chemical properties, separation and analysis of lanthanum. Electrolytic method for separating lanthanum from other lanthanons and chemical reduction of the chloride with potassium. Lanthanum salts are used for coloring phosphorescent preparations and the oxide is a useful constituent in ceramics. Lanthanum alloys are used as pyrophorics. The addition of lan thanum to ferrous alloys produces a hardening effect.
(A general; La, 17-7)

364-A. No Is Nobelium. *Chemical and Engineering News,* v. 35, Aug. 19, 1957, p. 30.

Element 102, the next to last element in the actinide series to be isolated, has been officially named nobelium, for which the symbol is No. The Commission on Inorganic Nomenclature of the International Union of Pure and Applied Chemistry named the new element. Three other symbols have been officially adopted by the commission—Es for einsteinium, Ar for argon, and Md for mendelevium.
(A general; EG-h31)

365-A. New Punched Card System Will Help You Organize Corrosion Data. G. T. Garrett and O. Osmon, Jr. *Chemical Engineering,* June 1957, p. 342-348.

System used at American Potash and Chemical Corp. 5 ref.
(A14e, R general)

366-A. Zirconium. *Columbia Southern Chemicals,* v. 2, no. 2, Summer 1957, p. 16-19. (CMA)

Occurrence and properties of zirconium. The desirability of separating hafnium from zirconium when the latter is used in nuclear reactors. Columbia-National Corp. has contracted with the AEC to produce hafnium-free zirconium, and a plant for the purpose is being constructed near Pensacola. Flow sheet of the basic steps in converting zircon to zirconium.
(A general, C general; Zr)

367-A. Fume Exhaustion in the Plating and Allied Industries. D. J. Fishlock. *Electroplating and Metal Finishing,* v. 10, June 1957, p. 184-191.

Features of fume exhaust systems and materials for exhaust system.
(A8a)

368-A. Fume Extraction From Arc Furnaces. J. Bain. *Foundry Trade Journal,* v. 102, June 20, 1957, p. 763-764.

Problem of fume from arc-melting furnace; results obtained on installation of extraction unit and wet scrubber for their disposal at English steel foundry.
(A8a, E10r, 1-2; ST)

369-A. Magnesium and Its Alloys. M. W. Mote and R. J. Jackson. *Materials in Design Engineering,* v. 46, July 1957, p. 115-134.

Properties, fabrication and uses of magnesium alloys now commercially available. (A general; Mg)

370-A. Science for Electroplaters. Pt. 26. Waste Disposal. L. Serota. *Metal Finishing,* v. 55, July 1957, p. 58-60.

Recovery of silver, zinc, copper, cyanide, chromic acids and other materials from cyanide plating baths, chromic anodizing baths, etc.; use of lagoons in disposing of wastes. (A8b; Ag, Zn, Cu)

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full within the next few months. A schedule of the principal headings in the revised version was published in the February issue.

371-A. Beryllium and Beryllia. L. David. *Metal Industry,* v. 90, June 21, 1957, p. 519-521.

Low neutron absorption makes beryllium and beryllium oxide suitable for use as reflectors and moderators in nuclear reactors; other chemical and physical properties. Processes used in fabrication, machining and joining. (To be continued.) (A general; Be, 17-7)

372-A. Beryllium and Beryllia. L. David. *Metal Industry,* v. 90, June 28, 1957, p. 546.

Physical properties, mechanical properties and uses of beryllium oxide in applications requiring strength and hardness at high temperatures; manufactured forms and available grades of beryllium oxide. 4 ref.
(A general; Be)

373-A. World Copper Resources. H. J. Miller. *Metal Industry,* v. 91, July 12, 1957, p. 23-25.

World reserves and production, primary metal production and copper recovered from scrap. (To be continued.) (A4p, A11; Cu, RM-p)

374-A. World Copper Resources. H. J. Miller. *Metal Industry,* v. 91, July 19, 1957, p. 49-50.

Copper deposits and production of copper in the United States and Rhodesia. (To be continued.)
(A11a; Cu)

375-A. Superpurity Aluminum. E. A. Bloch and P. H. Muller. *Metal Progress,* v. 72, Aug. 1957, p. 91-96.

Aluminum 99.99+% pure is made in tonnage for about twice the price of commercial (99.0+) metal. Its uses depend on improved conductivity, corrosion resistance, reflectivity and finish. It is made in a three-layer cell by electrolysis of Al-Cu alloy through a fusible electrolyte of mixed fluorides. Metal of 99.999% purity can be produced by a special technique.
(A general, C23p; Al-a, 17-7)

376-A. Our Long-Term Metal Needs. A. Graham Thomson. *Mining Journal* (Annual Review). May 1957, p. 4-7.

Estimates of per capita consumption during next 30 years; copper, lead, zinc, tin, aluminum and steel. (A4p; Cu, Pb, Zn, Sn, Al, ST)

377-A. Metal Coating Research at the Sketty Hall Laboratories of the British Iron and Steel Research Association. S. S. Carlisle. *Sheet Metal Industries,* v. 34, June 1957, p. 405-420.

Facilities and objectives in steel coatings research; research in the field of surface preparation, surface physics, coating by electrodeposition, organic coating, hot metal

coating practices, properties of coating and strip processing technology. 22 ref. (A9h, L general)

378-A. (French and German.) **Characteristics of Aluminum Foil.** E. Amann. *Aluminium Suisse,* v. 7, May 1957, p. 86-91.

Physical, chemical and technological properties of aluminum foil. Light-gage foil ranges from 0.005 to 0.05 mm. and heavy-gage from 0.025 to 0.3 mm. The former is used primarily in the manufacture of capacitators, packaging, building insulation and household wrapping, the latter in electrolytic condensers bottle caps and strip for deep drawing of cans.
(A general, T general; Al, 4-6)

379-A. (German.) **Heat and Power Supply System of an Integrated Iron and Steel Works.** Hans Weineck. *Stahl und Eisen,* v. 77, July 25, 1957, p. 988-998.

Combined system of gas utilization; distribution of the gross heat consumption; development of specific heat consumption and of blast furnace gas distribution; blast furnace gas piping system; regulation of power station boilers; blast furnace gas losses; heat consumed for heating purposes (openhearth furnaces, rolling mills); reorganization of steam generation; waste heat utilization. (A11e, D general, Fe, ST)

380-A. (German.) **Power and Heat Economy of an Integrated Iron and Steel Works.** Fritz Stolzenberg and Hermann Tiemeyer. *Stahl und Eisen,* v. 77, July 25, 1957, p. 998-1006.

Layout of the plant and flow of materials; development of production and heat consumption; effect of new plants; generation of current and steam; water supply.
(A11e, W10; ST)

381-A. (Italian.) **Titanium.** *Acciaio Inossidabile,* v. 24, Mar-June 1957, p. 68-74. (CMA)

General outline of physical, mechanical and technological properties of titanium and its industrial applications. (A general, 17-7; Ti)

382-A. (Japanese.) **Manufacturing of Ferro-Alloys.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 690-691.

Japanese ferro-alloy industry; production statistics, manufacturing problems and research program. 31 ref. (A4, C general; Fe, AD-n)

383-A. (Japanese.) **Electrolytic Iron and Steel.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 691-692.

Japanese production of electrolytic iron and steel; technology, costs, production statistics.
(A4p, C23; Fe, ST)

384-A. Development of Cast Iron-Base Alloys of Austenitic Type for High Heat Resistance and Scale Resistance. F. Eberle, J. H. Hoke and W. E. Leyda. Babcock & Wilcox Co. Research Center. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 121950, Jan. 1957, 99 p. $2.50.

Development of iron-base alloys to substitute for the cobalt-base alloy H.S. 21. The most promising alloys contained a minimum iron content of 45%, minimum carbon 0.50%, chromium not less than 20%, and between 27 and 32% nickel, part of which could be replaced by cobalt. Those alloys, strengthened with 5% additions of Cb, Ta, Mo and W, developed a creep-rupture strength at 1600 to 1800° F. approaching that of H.S. 21.
(A general, Q3m, 2-12; SS, SGA-h)

385-A. (French.) **Ore Searches and Statistical Methods.** P. Laffitte. *Annales des Mines,* Feb. 1957, p. 109-112.

Method of "calculation of probabilities" in assessing mineral deposits. (A4n, S12; RM-n)

386-A. (Italian.) **Precipitation Hardening Stainless Steels.** *Nickel,* no. 68, June 1957, p. 1-6.

General properties of these steels; heat treatments that can influence their mechanical and physical properties; welding, pickling, applications. Tables give composition and data on mechanical properties of wrought (martensitic, semi-austenitic, austenitic) and cast types.
(A general, Q general; SS)

A.S.M.-W.R.U. Program Ready for Test Runs

The pilot plant mechanized literature searching project being conducted for the American Society for Metals at Western Reserve University has now reached the initial testing stage. More than 5000 abstracts representing much of the important metallurgical literature of 1955 have been processed and will be ready for machine searching in September. An experimental searching selector has been built at the Center for Documentation and Communication Research at Western Reserve University which can be used to make test searches.

ASM members are urged to participate in the test program by submitting typical questions and subjects for literature searches. A limited number of searches will be made covering only the literature of 1955. For those problems selected, pertinent information retrieved will be sent to the inquirer at no charge.

For details, write:

American Society for Metals
Attention: Marjorie R. Hyslop
7301 Euclid Ave.
Cleveland 3, Ohio

387-A. (Japanese.) **New Anticorrosive High-Strength Aluminum Alloy "SZX".** Masahide Kosaki, Rihei Kawachi and Toshio Amitani. *Sumitomo Metals,* v. 9, Jan. 1957, p. 1-4.

Copper improves the mechanical properties of aluminum alloy hardened by the precipitation of Mg_2Si, yet lowers the corrosion resistance. Therefore, a rate of addition of about 0.25% by weight has been decided upon as the maximum value permissible. The alloy was quenched and artificially aged and has 37-43 kg. per sq. mm. ultimate tensile strength, 33-39 kg. per sq. mm. tensile yield strength and 12-20% elongation. (A general; Al)

388-A. Some Practical Aspects of Handling Lithium Metal. H. C. Meyer, Jr. Paper from "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 9-15.

Differences in handling are due primarily to its higher melting point, greater hardness and reactivity with nitrogen. Because of its higher melting point, liquid metal is handled at higher temperatures, which increases the hazard from burns. Low-carbon steel, or iron, is the most suitable construction material for use with lithium. 14 ref.
(A7p; Li, 14-10)

389-A. Russian Research and Development Projects. R. Sewell. *British Steelmaker,* v. 23, Aug. 1957, p. 244-245.

Research in iron production, steelmaking, casting and rolling.
(A9, D general, E general, F23)

390-A. Nemegosenda Lake—Columbium Area. G. E. Parsons. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 83-87.

Brief historical and general geological account. Columbium occurs in mineral pyrochlore. Ore zones located to date are in a metasomatic aureole surrounding an alkalic syenite plug. Sufficient ore is indicated to support a substantial operation. 2 ref. (A11a; Cb, RM-n)

391-A. Columbium-Uranium Deposits at North Bay, Ont. J. E. Gill and O. E. Owens. *Canadian Mining and Metallurgical Bulletin,* v. 50, Aug. 1957, p. 458-464.

Occurrence, concentration and associated minerals of uranian pyrochlore as determined by diamond drilling on and near group of islands in Lake Nipissing. 6 ref.
(A11a; Cb, U, RM-n)

392-A. What Are Stainless Steels? Joseph Winlock. *Foote Prints,* v. 29, no. 1, 1957, p. 19-29.

History of development of ferritic, martensitic and austenitic stainless steels; characteristics, mechanical properties, composition and typical examples of each group.
(A general; SS)

393-A. Will Titanium Beat Setbacks? G. J. McManus. *Iron Age,* v. 180, Sept. 5, 1957, p. 71-72. (CMA)

The titanium outlook after the defense cutbacks in the spring of 1957. Shipments are expected to be less than 7000 tons in 1957 and may drop to 4000 tons in 1958; inventories have also been reduced. Although the setback is serious, confidence in the future of titanium remains strong. Rem-Cru says that commercial shipments are six times what they were last year. Commercial supply is no problem today and prices have been falling.
(A4q; Ti)

394-A. New Metallurgical Laboratory. *Metal Industry,* v. 91, July 26, 1957, p. 69-70.

Facilities in new laboratory of British Welding Research Association. (A9h, K general)

395-A. World Copper Resources. H. J. Miller. *Metal Industry,* v. 91, July 26, 1957, p. 71-73.

Copper mining, refining, production and nature of ore deposits in Chile, Belgian Congo, Canada and Peru. (To be concluded.) (A4; Cu)

396-A. Rare Earth Elements in California. L. C. Pary. *Mining Magazine,* v. 47, Aug. 1957, p. 113-116. (CMA)

The Mountain Pass, Calif., deposits of bastnaesite are described. The "rare earths" are defined and their occurrence, mineralogy, use and prospects are reviewed. Precise data on Mountain Pass ore reserves are unavailable, but nearly all are in the Sulphide Queen ore body which covers a 20-acre area. Open-pit quarry operations are carried out on several faces of the deposit. (A11a; EG-g, RM-n)

397-A. Metal Resources of New Mexico and Their Economic Features Through 1954. Eugene Carter Anderson. *New Mexico Bureau of Mines, Mineral Resources,* Bulletin 39, 1957, 183 p.

Brief descriptions of all known deposits in the State other than those of iron and manganese. (A11a; RM-n)

398-A. Growing Importance of Platinum. Edith Goldman. *New Scientist,* v. 2, May 2, 1957, p. 32-34.

Production and applications. (A general, 17-7; Pt)

399-A. Low-Nickel Austenitic Stainless Steels. L. F. Spencer. *Product Engineering,* v. 28, p. 135-140.

Experience with "200" series stainless as replacement for straight 18-8 steels as to corrosion, fabrication, forming and welding. (A general; SS)

400-A. (English.) **Symposium on New Metals for the Chemical Industry. Pt. 2. Titanium as a Metal of Construction for the Chemical Industry.** E. Swainson. *Ingenieur,* v. 69, July 12, 1957, p. Ch.103-Ch.111. (CMA)

Review covers extraction and reduction, melting methods, fabrication and machining, welding, and physical, mechanical and chemical properties of the metal and its commercial alloys. Applications in the chemical industry include steam jet diffusers, filter press components, condenser "top-hat", pump impeller, valves, and anodizing racks. 15 ref. (A general, T29, 17-7; Ti)

401-A. (French.) **Present Trends in Magnesium.** *Annales des Mines,* Feb. 1957, p. 104-107.

World production figures 1946-1955; U. S. consumption, 1946-1955, by use categories of magnesium alloys not containing aluminum; brief indication of plant activity in U. S., Canada, Great Britain, and Hungary to improve production techniques and volume. 15 ref. (A4p, 17-7; Mg)

402-A. (French.) **A Look at the Uranium Industry Throughout the World.** Jacques Mabile. *Société des Ingenieurs Civils de France, Memoires,* v. 110, Mar-Apr. 1957, p. 76-84.

Types and locations of deposits and factors involved in exploitation; economics of refining; production to date and probable capacities in different areas of Western World by 1960; resources and known reserves; probabilities of future discoveries. (A4n; U)

403-A. (German.) **Organization of Materials and Production as a Function of Planning and Management.** Werner Schutte, Ulrich Sabass, Hans-Heinrich von Lintig and Anton Schütz. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1045-1064.

Thirty years experience at the Industrial Engineering Department of the August Thyssen-Hütte; supply of materials; prime records; routing cards; inventory control, with punched cards, routing of an order; production planning and scheduling; scheduling orders by route cards; quality control technical cost analysis; relation between technical characteristic data and cost; high-speed cost accounting; production planning and control; long-term and short-term planning. (A5b; ST)

404-A. (German.) **Dust Removal in a Strip Sintering Plant.** Bernhardt Weilandt, Fritz Kruse and Nikolaus Petrusch. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1064-1069.

Dust content of the air; measures to prevent formation of dust; removal of the dust from the waste gases; recovery of the dust. (A8a, B16; Fe, RM-n)

405-A. (German.) **Dust Removal in a Pellet Sintering Plant.** Rudolf Nase. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1070-1074.

Dust removal plants; life of fan rotors; ventilator rotors and cyclones; return of dry dust and mud; settling tank, water cycle and water consumption; data on the quantities, grain sizes and chemical composition of the dusts. (A8a, B16b, 1-2; Fe, RM-n)

406-A. (Hungarian.) **Processing of Vanadium Sludges in Connection With Alumina Production.** Imre Veres. *Kohaszati Lapok,* v. 90, Apr-May 1957, p. 181-184. (CMA)

Foreign and domestic methods for recovery of vanadium from vanadium sludges; salient points of new method. These include cleaning of the sludge by burnt lime or lime milk; treatment with quick lime after acidification to pH 6, which takes care of all contaminants; and the separation of a precipitate containing vanadium oxide, suitable directly for metallurgical purposes. 23 ref. (A11c; Al, V)

407-A. (Italian.) **Zama Alloys for Die Casting. Pt. 2.** Ludovica Alladio. *Rivista di Meccanica,* no. 158, Mar. 30, 1957, p. 19-25.

Preparation of alloys; properties and mechanical working of castings; aging and stabilizing treatment; corrosion and surface finishes. (A general; Zn, 5-11)

408-A. (Portuguese.) **Continued Progress at Volta Redonda.** *Engenharia, Mineracao e Metalurgia,* v. 25, May 1957, p. 247-248.

The 1956 production figures include 739,996 tons of ingots, 579,079 tons of rolled products, variety of chemical byproducts. Brief survey of medical, housing, educational services provided or supported by this plant of Cia. Siderurgica Nacional. (A4p; ST)

409-A. (Portuguese.) **Iron Ore From Vale do Rio Doce Company.** *Engenharia, Mineracao e Metalurgia,* v. 25, May 1957, p. 266-267.

Caue deposits belonging to Cia. Vale do Rio Doce contain greater part of 15 billion tons of iron ore reserves in State of Minas Gerais. In 1956 2,270,138 long tons of ore was exported (including 16,427 tons of fines), 44.5% of which was bought by U. S. (A4p; Fe, RM-n)

410-A. (Spanish.) **Reflections on the Metallurgy of Iron and Steel.** Jorge A. Riviere Manen. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 171-186.

Historical review of processes and technological bases of progress in steelmaking; examination of technico-economic scene in U. S. as exemplified in steel industry; conclusions as to benefits in technical, economic and human betterment to be derived from application to Spanish industry of U. S. type organization and practices. (A2, A4, D general, Fe, ST)

411-A. (Book.) **Handling and Uses of the Alkali Metals.** Advances in Chemistry Series, no. 19, 1957, American Chemical Society, 1155 16th St., N.W., Washington 6, D. C. 138 p. $4.75.

A collection of papers comprising a symposium presented before the Division of Industrial and Engineering Chemistry at the 129th meeting of American Chemical Society. Pertinent papers abstracted separately. (A general, 17-7; Li, Na, 14-10)

412-A. (Book.) **Metal Statistics 1957.** 856 p. 1957. American Metal Market, 18 Cliff St., New York 38, N. Y. $3.50.

50th Anniversary edition contains statistical data and Buyers' and Sellers' Guide. (A4)

413-A. (Book.) **Economic Geology of the Bishop Tungsten District, Calif. Special Report 47.** Paul C. Bateman. Aug. 1956, 87 p. Division of Mines, Ferry Bldg., San Francisco 11, Calif. $4.

General description of geology of the district: 54 deposits described, which are, with a few exceptions, tactite. Maps and other illustrations of the better developed and more productive deposits. Procedure for more efficient prospecting is suggested. 31 ref. (A4n; W, RM-n)

414-A. (Book.) **Progress in Nuclear Energy, Ser. 5, Metallurgy and Fuels.** H. M. Finniston and J. P. Howe, Editors. 813 p. 1956. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $21.

Collection of contributions dealing with current status of metallurgy in the field of nuclear energy. The nine sections include: production and preparation of uranium metal, thorium, beryllium and zirconium, physical metallurgy of plutonium, preparation and properties of the rare earths, ceramics, fuel elements, effects of radiation and solid-state physics. (A general, P18, W11p, 17-7)

415-A. (Book.) **Metallurgical Progress-3.** 88 p. 1957. Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $6.

Literature reviews on refractories, nondestructive testing, coke, foundry technology and mechanical properties of cast iron. Papers previously abstracted as originally published. (A general, 10-4)

416-A. (Book.) **1957 SAE Handbook.** 1176 p. 1957. Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N Y. $5.

Compositions, properties, testing methods; SAE standards for ferrous and nonferrous metals; nonmetallic materials; automotive parts, accessories, and electrical equipment. (A general, S22)

B Ore and Raw Material Preparation

87-B. How A. S. & R. Raised Molybdenite Recovery on Copper Concentrate. *Engineering and Mining Journal,* v. 158, Aug. 1957, p. 104-106. (CMA)

American Smelting and Refining has improved over-all metal recovery at Silver Bell, Ariz., by installing a Morenci-process molybdenite recovery plant. The low-grade copper sulphide ore contains a small amount of molybdenum; the recleaner flotation concentrate contains 0.3-0.8% Mo. The Morenci process consists of several flotation steps without intermediate roasting.
(B14h; Cu, Mo)

88-B. Importance of Stainless Scrap Segregation. T. J. Wayne. *Waste Trade Journal,* June 8, 1957, p. 42-44.

Some results of laxity and effects of undesirable inclusions on surface quality of stainless stress the need for better identification and segregation. Suggestions for scrap preparation.
(B23, S10; SS, RM-p)

89-B. New Trends in the Design of Sinter Plants. A. B. Patkovskii. *Stal',* v. 15, no. 3, 1955, p. 208-215. *(Henry Brutcher Translation* no. 3836.)

Suggested improved flowsheet for sinter plants; improved individual operations such as methods of metering, transporting and screening of sinter; blending and mixing of charge components.
(B16, 1-2; ST, RM-n)

90-B. Reduction Experiments on Steep-Rock Ore. J. O. Edstrom. *Jernkontorets Annaler,* v. 140, no. 2, 1956, p. 130-136. *(Henry Brutcher Translation* no. 3842.)

Micrographic, X-ray and chemical analyses of Steep-Rock ore from Canada; main components; mineralogic make-up compared with rich, coarsely crystalline hematites. Absence of volume changes at end of reduction experiments.
(B general; Fe, RM-n)

91-B. (Polish.) **Self-Fluxing Agglomerate.** Eugeniusz Nazanek and Ryszard Benesch. *Hutnik,* v. 24, May 1957, p. 181-186.

Considerable improvement in blast furnace efficiency is achieved by the use of self-fluxing agglomerate when poor grade ores are used. The agglomerate is made of a mixture of ore and limestone. 6 ref.
(B14m, Fe, RM-n)

92-B. (Russian.) **Intensification of Iron Ore Sintering.** A. E. Lebedev. *Metallurg,* v. 2, May 1957, p. 10.

Laboratory experiments whereby around 20% increase of gas permeability and process efficiency both for regular and fluxed sinter is obtained. The essential step is to premix and humidify the ore 5 min. before addition of the coke and then mix for 3 min.
(B16a; Fe, RM-n)

93-B. (Russian.) **Modern Techniques at the Sintering Plant of the Cherepovetsk Works.** N. M. Yakutsiner and L. P. Migutskii. *Stal',* v. 17, Apr. 1957, p. 293-300.

Results at the Cherepovetsk iron and steel works are given, confirming the use of high-capacity sintering machines to produce high-grade sinter of high basicity from the finely ground concentrates with siliceous gangue when the limestone admixed to the sintering burden is crushed sufficiently fine. (B16a; Fe, RM-n)

94-B. Canadian Iron and Steel Boosted by New Inventions. *Canadian Metalworking,* v. 20, July 1957, p. 30-32.

New type of mill and dry magnetic concentrator together with jet smelters may provide increasing production of iron from Canadian ores.
(B13, B14; Fe, RM-n)

95-B. North Rankin Nickel Mines. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 93-97.

History, geology, minerology, equipment, mining methods and milling. (B12, B13; Ni, RM-n)

96-B. Bicroft Uranium Mines. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 104-107.

Ore is in radioactive pegmatite dykes; mining is by shrinkage methods; milling employs acid leach, counter current decantation and ion exchange.
(B12, B13, A11a; U, RM-n)

97-B. Emulsion Flotation. A. W. Fahrenwald. *Mining Congress Journal,* v. 43, Aug. 1957, p. 72-74.

Process employs reagents, soap and oil in emulsion form. Theory and advantages vs. froth flotation for manganese. (B14h; Mn)

98-B. (French.) **Application of Statistical Methods to the Study of Certain Problems Encountered in the Ore Treatment Industry. Pt. 3. Progressive Method of Comparison of Two Experimental Methods.** P. Gy. *Annales des Mines,* Feb. 1957, p. 99-103.

To compare two different methods of flotation several tests are necessary; attempts to define adequate statistical sampling procedures. (B11, B14h, S12h; RM-n)

99-B. (German.) **Recovery of Rare Earths From Cola Phosphate.** Miroslav Ruprych. *Chemische Technik,* v. 9, June 1957, p. 353-354. (CMA)

Although the rare earth content of "cola concentrate" is not high (between 0.8 and 4.9%, averaging in 12 samples about 1.6%), it may lead to about 25 tons per year of rare earths in an average plant. Present methods are as yet economically inefficient, but the use of ion exchangers may improve efficient recovery. The main constituents of the rare earths in "cola concentrate" were identified as cerium, lanthanum, praseodymium, neodymium and samarium. 12 ref.
(B14; EG-g, RM-n)

100-B. (German.) **Turbulence Flocked Bed Roasting of Freiberg Zinc Blendes and Pyrites.** Ernst Theurich. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 191-199.

Increased importance of method due to shorter reaction time and lower investment; roasting of Freiberg zinc blende and arsenical Freiberg pyrites on an experimental basis; volatilization of arsenic, lead, cadmium during roasting; leachability of roasted zinc blende. 4 ref.
(B15; Zn, RM-n)

101-B. (Spanish.) **Hot Softening Behavior Under Stress of Different Types of Refractories.** Eugenio Perez Blanco. *Instituto del Hierro y del Acero,* v. 10, Apr-June, 1957, p. 147-159.

Review of DIN, ASTM, British Standard and European test norms; causes of softening; characteristics and behavior of 10 refractory materials. 17 ref. (B19; RM-h)

C Extraction and Refining

242-C. The Production of Titanium Trichloride by Arc-Induced Hydrogen Reduction of Titanium Tetrachloride. T. R. Ingraham, K. W. Downes and P. Marier. *Canadian Journal of Chemistry,* v. 35, Aug. 1957, p. 850-859. (CMA)

Method of producing pure, comminuted $TiCl_3$ based on the ability of titanium to liberate hydrogen from HCl gas. The hydrogen reacts with pure $TiCl_4$ vapor in an arc of electrodeless discharges, forming a blue glow; $TiCl_3$ precipitates on the walls of the discharge tube. (C26; Ti)

243-C. Experimental Electric Smelting of Ilmenite to Produce High-Titania Slag and Pig Iron. G. E. Viens, R. A. Campbell and R. R. Rogers. *Canadian Mining and Metallurgical Bulletin,* v. 50, July 1957, p. 405-410. (CMA)

Smelting of beneficiated ilmenite ore in a continuous 3-phase, 250-kva. open-top electric furnace. In a comparative study, minus ¼-in. ore was smelted using the standard method, and fine ore of the order of minus 14 mesh was smelted in briquet form by the open bath method, and in the unagglomerated form by the cold dry-top method. The last method was found to be superior. 8 ref. (C21d; Ti)

244-C. Refining Zone Refining. *Chemical and Engineering News,* v. 35, Aug. 12, 1957, p. 88-89.

An automatic refining device designed to produce relatively large amounts of high-purity materials such as silicon. (C28k, 1-2)

245-C. New Process for Titanium. *Chemical Engineering Progress,* v. 53, July 1957, p. 94. (CMA)

Advantages claimed for the process include use of low-grade ore or any titanium-containing materials, use of hydrochloric acid rather than chlorine for chlorination, low operating temperatures for chlorination and decomposition; and high-purity titanium tetrachloride product due to selective chlorination, which excludes co-precipitation of other impurities. (C19r; Ti)

246-C. Cold Chlorination: Key to Low-Cost $TiCl_4$. *Chemical Week,* v. 80, July 20, 1957, p. 76, 78. (CMA)

Ilmenite is dissolved in sulphuric acid and the iron content is reduced by two controlled crystallizations if its level interferes. The sulphuric solution is then treated with hydrogen chloride at 0° C. and saturated with potassium chloride. Further cooling precipitates K_2TiCl_6, from which $TiCl_4$ is recovered on heating in the range 330-400° C. Iron remains behind. (C19r; Ti)

247-C. Electrorefining Titanium. *Metal Industry,* v. 91, July 19, 1957, p. 47-48. (CMA)

Titanium has been successfully electro refined in the laboratory by a fused-salt electrolysis with impure scrap or sponge as the anode; pure titanium is collected at the cathode. The cathode current density depends mainly on the amount of soluble titanium chloride in the electrolyte but the condition of the anode is also influential. (C23p; Ti)

248-C. Zone Melting. W. G. Pfann. *Metallurgical Reviews*, v. 2, 1957, p. 29-76.

Types of zone-melting process, including zone refining, zone leveling and single-crystal growth; theory, practice and applications. 79 ref. (C28k, N3r)

249-C. How Calera Solved Metallurgical Problems at Garfield Cobalt Plant. J. S. Mitchell. *Mining World*, v. 19, June 1957, p. 54-56.

New process for producing cobalt granules, operational problems, mechanical weaknesses. Batch operations to be replaced by continuous flow and plant is to be added for electrolytic refining. (C general; Co)

250-C. Purification of Thorium by Solvent Extraction. Morton Smutz, M. E. Whatley and G. L. Bridger. Iowa State College, *U. S. Atomic Energy Commission*, ISC-415, July 1953, 92 p.

Extraction of thorium nitrate with tributyl phosphate from aqueous solutions containing phosphate, sulphate and nitric acid. The specific objective was to develop a process to produce pure thorium from a thorium concentrate obtained by the selective precipitation of thorium phosphate from a monazite-sulphuric acid solution. (C27; Th)

251-C. Arc Melting and Continuous Casting of Uranium. H. A. Saller, R. F. Dickerson, and E. L. Foster, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission*, BMI-926, July 13, 1954, 31 p.

A melting procedure that would be satisfactory for use on a large production furnace was developed. This technique is based entirely on changing arc voltages and therefore would be amenable to automation by means of electronic controls. This melting technique produced ingots with no shrinkage voids and without unconsolidated areas. (C5h, C5q; U)

252-C. Large-Batch Melting of Uranium. R. M. Lang, G. W. Rengstorff, N. H. Keyser, and H. W. Lownie, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission*, BMI-932, Aug. 2, 1954, 33 p.

Both a 3-phase direct-arc furnace and a high-frequency induction furnace were used. In the direct-arc furnace, only 15% of the metal charged was recovered as metal. In the induction furnace, close to 100% of the metal charged was recovered as metal in the ingot. (C5h, C5j; U)

253-C. Recovery of Thorium From Brazilian Monazite Sludge by Nitric Acid Digestion. W. A. Meeley, M. J. Snyder and R. B. Filbert, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission*, BMI-946, Aug. 24, 1954, 27 p.

The method can be used as the first step in a process for the recovery and purification of thorium from Brazilian sludge since the treated sludge is in a suitable condition for slurry extraction to recover the thorium. The problems of corrosion and the removal of interfering ions from the sludge were studied briefly. (C19; Th)

254-C. Low-Temperature Chlorination of Columbium-Bearing Titanium Minerals. V. A. Nieberlein. *U. S. Bureau of Mines. Report of Investigations* 5349, July 1957, 15 p. (CMA)

A cheap extraction process for low-titanium ore with valuable minor metals (e.g., columbium) consists of reducing the ore concentrate with coke at high temperatures to form a carbide-suboxide sinter, and chlorinating in the range 400-500° C. using metallic apparatus. Iron chloride and columbium chloride are then separated by fractional condensation. Descriptions and diagrams of the apparatus. (C19r, 1-17; Ti, *Cb*)

255-C. (Japanese.) **Electrorefining.** *Electrochemical Society of Japan, Journal*, v. 24, Dec. 1956, p. 635-642.

Electrorefining of copper, gold, silver, nickel, cobalt, antimony, tin, cadmium, chromium and manganese. 69 ref. (C23p; Cu, Au, Ag, Ni, Co, Sb, Sn, Cd, Cr, Mn)

256-C. (Japanese.) **Extraction of Light Metals.** *Electrochemical Society of Japan, Journal*, v. 24, Dec. 1956, p. 678-681.

Electrorefining of aluminum, magnesium and titanium. 90 ref. (C23p; Al, Mg, Ti)

257-C. (Japanese.) **Electrolysis of Fused Salts.** *Electrochemical Society of Japan, Journal*, v. 24, Dec. 1956, p. 682-684.

Brief review of electrolysis of fused salts of alkali metals, alkali earth metals and special elements, such as zirconium, beryllium and uranium. 70 ref. (C23p; EG-e, EG-f, Zr, Be, U)

258-C. (Russian.) **Production of Medium-Carbon Ferrochromium.** P. A. Sakharuk. *Stal'*, v. 19, Apr. 1957, p. 326-328. (Also available as *Henry Brutcher Translation* no. 3995.)

Comparison of various methods of producing ferrochromium with medium (0.50 to 2.0%) carbon contents; refining of high-carbon ferrochromium by blowing with oxygen in a converter; mixing of low-carbon with high-carbon ferrochromium, the low-carbon grade having been produced by the flux silicothermic process or by fluxless silicothermy of lump (scarce) or fine (plentiful) ores. (C21; Fe, Cr, AD-n31)

259-C. Mechanism of Oxidation of Ferrous Ions by Atmospheric Oxygen in the Hydrometallurgy of Zinc. L. S. Getskin and V. D. Ponomarev. *Journal of Applied Chemistry of the USSR*, v. 29, July 1956, p. 1071-1076. (Translated by Consultants Bureau, Inc.)

A solution pH between 3 and 7 oxidation is a first-order reaction with respect to iron, with temperature coefficient of reaction rate of 2.08 indicating kinetic nature of process. Adsorption of oxygen by precipitates of ferric compounds plays important role in process. 5 ref. (C19; Zn)

260-C. Studies on Electrolytic Titanium From Fused Salts. K. Ono, et al. *Tohoku University, Research Institutes, Science Reports, Series A. Physics, Chemistry and Metallurgy*, v. 9, June 1957, p. 227-238. (CMA)

The mechanism of electrolysis was studied and results were compared with the two observed values of the decomposition voltage of K_2TiF_6. The dark black cathodic deposit was not metallic. Formation of Ti_2O_3 is thought to interfere with the electrolytic deposition of titanium. (C23p; Ti)

261-C. Refining of Thorium by Solvent Extraction. A. Ewing, S. J. Kiehl, Jr., and A. E. Bearse. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-955, Oct. 19, 1954, 70 p.

Thorium up to 99.9 + % was obtained by extraction of mantle-grade $Th(No_3)_4$ with 30% TBP, 70% Solvesso 100, using nitric acid salting. Rare earths were undetectable in the purified thorium. 13 ref. (C19; Th)

262-C. Process for Separating Thorium Compounds From Monazite Sands. Kernal Glenn Shaw, Morton Smutz and G. L. Bridger. Iowa State College, *U. S. Atomic Energy Commission*, ISC-407, Jan. 1957, 107 p.

Studies to determine the optimum conditions for the digestion of monazite sand and for the separation of thorium, rare earths and uranium by fractional neutralization of the monazite sulphate solution. The most effective separation was obtained when the monazite solution was dilute and when ammonium hydroxide was used as a neutralizing agent. 52 ref. (C28; Th)

263-C. (French.) **Separation of Metals: Columbium and Tantalum.** Marcel Chaigneau. *Comptes Rendus*, v. 244, Feb. 11, 1957, p. 900-901.

Columbium can be separated from tantalum by subjecting pentoxide mixture to action of chloride, bromide or iodide of aluminum under heat and vacuum conditions. A fractionated sublimation makes it possible, in all cases, subsequently to isolate the halogens thus formed. Aluminum iodide is the most favorable medium. 11 ref. (C19r; Cb, Ta)

264-C. (French.) **Refining of Protactinium by Chromatography and Electrophoresis on Paper.** Michael Lederer and Jacques Vernois. *Comptes Rendus*, v. 244, May 6, 1957, p. 2388-2390.

Study of solvents containing hydrofluoric acid which make it possible to avoid hydrolysis of Ta, Cb, Zr and Ti (which usually accompany Pa^{231}), and thus accomplish separation. 6 ref. (C19; Pa)

265-C. (French.) **Contribution to the Study of the Separation of Zirconium and Hafnium by Liquid-Liquid Extraction.** N. Isaac and R. de Witte. *Energie Nucleaire*, v. 1, Apr-June 1957, p. 71-76. (CMA)

Various stages of purification of technical zirconium oxide and of separation of zirconium and hafnium studied. 7 ref. (C28; Zr, Hf)

266-C. (French.) **Inorganic Chemical Industry in France. The Manufacture of Uranium.** Henri Guérin. *Nature*, no. 3262, Feb. 1957, p. 64-68.

French metallic uranium requirements are supplied entirely by Bouchet plant of government's Atomic Energy Commission. Process principles and details of production cycle at this plant. (C general; U)

267-C. (Japanese.) **Recovery of Alkali and Vanadium From Waste Liquor Obtained by Treating Iron Sand by Sodium Sulphate.** Yozo Takimoto and Hiroshi Hattori. *Chemical Society of Japan, Journal, Industrial Chemistry Section*, v. 60, Feb. 1957, p. 145-147. (CMA)

A titaniferous iron sand (29.84% TiO_2, 50.44% FeO, 4.80% SiO_2 and 0.18% V_2O_5) was mixed with Na_2SO_4 and coke and roasted at 1100° C. for 2 hr., followed by quenching in cold water. After separation of the water-soluble products, the residue was treated with 10-15% H_2SO_4. 14 ref. (C19; V)

268-C. (Japanese.) **Manufacture of Metallic Sodium From Sodium and Amalgam.** Tutuzo Okadu, Shiro Yo-

shida and Tokuda Watanabe. *Chemical Society of Japan, Journal,* v. 60, June 1957, p. 666-670.

Research on manufacture of metallic sodium by amalgam concentration cell; the test was carried out in horizontal bath and with a revolving anode. (C29; Na)

269-C. (Polish.) **Problems of Manganese Production.** Jacek Dembowski and Antoni Riesenkampt. *Hutnik,* v. 24, May 1957, p. 192-197.

Obtaining manganese from poor grade ores by thermal, electric and chemical methods; recovery of manganese from openhearth slag. 8 ref. (C general, A11d; Mn, RM-n, RM-q)

270-C. Recovery of Lithium From Complex Silicates. John W. Colton. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 3-8.

Lithium ores of major economic importance are spodumene, lepidolite, Trona concentrates and amblygonite. Processes of recovery of lithium from silicate minerals involve either high-temperature ion substitution reactions or volatilization, and yield the sulphates, carbonates, hydroxides or chlorides. These salts are readily interconvertible. Metallic lithium is made by electrolysis of lithium chloride. 21 ref. (C19, C23p; Li)

271-C. Present and Potential Uses of Sodium in Metallurgy. W. J. Kroll. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 138-154.

The high-intermetallic affinity of sodium for certain elements such as sulphur, arsenic, antimony and bismuth suggests its use as a cleanser for raw metals. Its high halogen affinity recommends it as a reducing agent for producing pure metals and alloys. The reduction of titanium tetrachloride and zirconium tetrachloride with sodium is compared with magnesium reduction. 90 ref. (C26; 17-7, Na)

272-C. From Oxide to Titanium. *Chemical and Engineering News,* v. 35, Sept. 2, 1957, p. 100, 103. (CMA)

The aluminum reduction of titanium is theoretically impossible on thermodynamic grounds, but a recent patent assigned to the Illinois Institute of Technology decribes such a reduction using a 4:1 excess of aluminum to make alumina and a 30-70% alloy of titanium. (C26; Ti, *Al*)

273-C. Novel Chlorination Furnace Shows Promise. *Chemical Engineering,* v. 64, Sept. 1957, p. 170-172. (CMA)

A furnace of Salem-Brosius, Inc., chlorinates refractory ores (rutile, zircon, spodumene, etc.) on a continuous tonnage basis by sweeping the ore, coke breeze and chlorine through a graphite reactor at 5-150 ft. per sec. The reactor tube is used as a resistor to produce temperatures of 2500-3000° F. (C19r, 1-2; EG-d, RM-n)

274-C. Equilbrium Between Titanium Metal, $TiCl_2$, and $TiCl_3$ in NaCl-KCl Melts. W. C. Kreye and H. H. Kellogg. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 504-508. (CMA)

$TiCl_2$ makes up 87-91% of the dissolved titanium and tetravalent titanium makes up less than 1%. Proportionation between titanium and $TiCl_3$ appears to be exothermic. The equilibrium constant of the reaction was determined as a function of concentration. Analytical procedures used. 7 ref. (C23p; Ti)

275-C. How the Inverted-Bosh Blast Furnace Increases Scrap Smelting Capacity. *Engineering and Mining Journal,* v. 158, Aug. 1957, p. 100-101.

Inverting the bosh on an existing furnace raised copper scrap smelting capacity from 35 to 100 tons per day charge. A new furnace with a similar design is described. (C21a, 1-2; Cu, RM-p)

276-C. Continuous Casting: Review and Outlook. Rufus Easton. *Journal of Metals,* v. 9, Aug. 1957, p. 1045-1048.

The Asarco and Junghans processes for casting copper and brass; the direct chill process, Properzi, Tessmann, Goss, Hazelett processes for casting aluminum; continuous casting of steel. 28 ref. (C5q, D9q; Cu, Al ST)

277-C. Separation of Nickel and Zinc From a Mixture of Their Salts: Pt. 2. Reduction of Nickel Oxide. R. A. Sharma, P. P. Bhatnagar and T. Banerjee. *Journal of Scientific and Industrial Research,* v. 16A, June 1957, p. 255-259.

A systematic study of the reaction between nickel oxide and carbon has been taken to procure data to be used in separating nickel and zinc from 4 mixtures of their oxides by carbon reduction. 4 ref. (C28; Ni, Zn)

278-C. Zinc Production in a Blast Furnace. S. W. K. Morgan. *Mining Journal,* v. 249, Aug. 9, 1957, p. 163-165.

Operation and arrangement of zinc blast furnace. Process can be applied to mixed lead-zinc concentrates. No extra carbon is needed for lead production. (C21a; Zn)

279-C. Design and Cost Estimate for a Pyrometallurgical Reprocessing Plant. Louis Basel and Joseph Koslov. *Nucleonics,* v. 15, Aug. 1957, p. 56-60.

Prediction of what the plant, with its high activity, remote handling and shielding will look like. The oxide-slagging method is used and 18,000 kg. of enriched uranium alloy can be processed per year. (C6c, W12a, 1-2; U)

280-C. Caustic Fusion of Columbite-Tantalite Concentrates With Subsequent Separation of Niobium and Tantalum. James A. Pierret and Harley A. Wilhelm. Iowa State College, *U. S. Atomic Energy Commission,* ISC-796, Aug. 1956, 25 p.

A procedure for the production of spectrographically pure columbium and tantalum oxides from columbite-tantalite concentrates; the procedure involves a caustic fusion process and the separation of tantalum and columbium by liquid-liquid extraction. 32 ref. (C28; Cb, Ta)

281-C. (German.) **Separation of Rare Earths Contained in Cola Concentrates.** Witold Mazgaj. *Chemische Technik,* v. 9, June 1957, p. 350-353. (CMA)

"Cola concentrate", an apatite used as a raw material for the production of phosphoric manures, contains constant amounts (about 0.8%) of rare earths. The rare earth content was separated by treating the apatite with nitric acid, separating the fluorine compounds and neutralizing the remaining free nitric acid and about 50% of the first free hydrogen of the phosphoric acid with $CaCo_3$ calcium carbonate. About 5.5 kg. mixed oxides were obtained from 1 ton of "cola concentrate". 14 ref. (C19; EG-g)

282-C. (German.) **Welding rectifiers for the Arc Melting of Titanium and Zirconium.** E. Bergmann. *Elektrowaerme,* v. 15, Jan-Feb. 1957, p. 38-39. (CMA)

Welding rectifiers of about 2500 amp. rated current used in Europe for the arc melting of titanium and zirconium. The energy required for the melting of titanium ingots of about 16-30 cm. diameter is about 4.5 kw-h. per kg. in a two-stage melting process. For zirconium, due to its lower specific heat and heat of fusion, the energy requirements are lower. 3 ref. (C5h, W29a, 1-2; Ti, Zr)

283-C. (German.) **Elimination of Tin From Tungsten Concentrates.** Ferdiand Kadlec. *Neue Hütte,* v. 2, July 1957, p. 422-425.

Utilizing tin compounds such as $SnCl_2$, SnS and SnO; evaporation of tin as SnO; mixing of the concentrate with coke in rotary kiln. 4 ref. (C general; W, *Sn*)

284-C. (German.) **Experiments on the Openhearth Process.** Milan Jovanovic and Ernst Justus Kohlmeyer. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, June 1957, p. 273-284.

A study of the openhearth process at the Zvecan lead smelter (Yugoslavia) with particular reference to the effects of variations in blast volume and pressure, and of impurities in the ore on the optimum furnace output. Furnace output is shown to be directly proportional to the PbS content of the concentrate, the process being unworkable with concentrates containing less than 65% Pb. The presence of even 1% copper in the concentrate will stop the operation. (C21c; Pb)

285-C. (Russian.) **Causes of the Anodic Effect in the Electrolytic Production of Aluminum.** L. N. Antipin and N. G. Turin. *Zhurnal Fizicheskoi Khimii,* v. 31, May 1957, p. 1103-1110.

The anodic effect in cryolite alumina melts owes its appearance to the discharge of fluorine containing ions at the anode. It has been suggested that the compounds COF_2 and CF_4 may form at the carbon anode. The nonwettability effect observed at the anode is caused by the presence of these substances on its surface. 24 ref. (C23; Al)

D Iron and Steelmaking

213-D. Special Bar Raises Killed Steel Yield. R. G. Brown. *Iron Age,* v. 180, July 4, 1957, p. 88-89.

Suspending special aluminum bar in ingot mold eliminates difficulty in keeping aluminum under surface of molten steel long enough to do the oxidizing. (D9k; ST-c *Al*)

214-D. Tonnage Oxygen. Field of Application in Steelmaking. F. J. Clark and J. L. Harrison. *Journal of the Iron and Steel Institute,* v. 186, July 1957, p. 305-323.

Operating costs for openhearth furnaces with and without oxygen; combination of oxygen application in the openhearth and oxygen-steam-blown basic bessemer converter. Developments in tonnage plants; plants in operation or under construction. 16 ref. (D2g, D3f; ST, *O*)

215-D. Thermodynamic Study of FeO-Fe_2O_3-SiO_2, FeO-Fe_2O_3-P_2O_5, and FeO-Fe_2O_3-SiO_2-P_2O_5 Molten Systems.

E. T. Turkdogan and Patricia M. Bills. *Journal of the Iron and Steel Institute*, v. 186, July 1957, p. 329-339.

Relation of Fe^{+++}/Fe^{++} ratio to silica and phosphorus pentoxide concentrations for pco_2/pco ratios from 75.0 down to very low values where melts are in equilibrium with liquid iron. 22 ref. (D11n, P12; Fe, RM-p)

216-D. Maintenance of Equilibrium in Blast Furnace Operation. Charles E. Agnew. *Steel*, v. 141, July 29, 1957, p. 120-134.

Maintenance of equilibrium between preparation for smelting and smelting as controlled by blast temperature and pressure and furnace burden in blast furnace operations. (To be continued.) (D1b, D11; ST)

217-D. Maintenance of Equilibrium in Blast Furnace Operation. Pt. 2. Charles E. Agnew. *Steel*, v. 141, Aug. 5, 1957, p. 96-104.

Discusses furnace operation in relation to maintenance of thermal and mechanical equilibria; of importance are burden weight, resistance to gas passage, gas volume, chemical composition of burden, blast temperature and heat volume. (D1b, D11; ST)

218-D. Boron in Iron and Steel. R. A. Grange. Part 1 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 1-57.

Historical review, fundamental aspects, addition of boron to steel, effect of boron on heat treating characteristics, engineering properties, boron in ferrous alloys other than constructional steels. Bibliography arranged by years.
(D9r, Q general, 2-10; ST, B, AD-q)

219-D. Calcium in Iron and Steel. F. J. Shortsleeve and D. C. Hilty. Part 2 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 61-101.

Calcium metal, deoxidation and desulphurization by calcium, application of calcium in steel and in cast iron. Bibliography listing 91 items. (D11r; ST, Ca, AD-r, AD-a)

220-D. Columbium in Iron and Steel. W. O. Binder. Part 3 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 105-414.

Columbium minerals and metal, constitution of iron-columbium and alloys, effects of columbium on structure and mechanical properties of various steels, physical properties and corrosion resistance of austenitic stainless containing columbium, and gas-turbine alloys containing columbium and tantalum. Bibliography listing 319 items. (D9r, Q general, R general, 2-10; ST, SS, Cb, AD-q)

221-D. Zirconium in Iron and Steel. George T. Motock and C. M. Offenhauer. Part 4 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 417-502.

Extraction and properties, alloys of interest in steelmaking, effects of zirconium in iron and steel. Bibliography of 145 items.
(D9r, Q general, 2-10, AY, Zr, AD-q)

222-D. Development and Industrial Application of Continuous Casting to Steel. M. S. Boichenko, V. S. Rutes and N. A. Nikolaev. *Stal'*, v. 16, 1956, p. 505-513. (*Henry Brutcher Translation* no. 3818.)

Previously abstracted from original. See item 208-D, 1956.
(D2, D9q; ST)

223-D. Vacuum Treatment of Steel. V. G. Speranskii. *Metallurg*, no. 8, Aug. 1956, p. 12-15. (*Henry Brutcher Translation*, no. 3973.)

Previously abstracted from original. See item 343-D, 1956.
(D8m, Ay)

224-D. (Russian.) **Quality of Steel Ingots Improved by Ultrasound Treatment.** N. P. Nikolaichik and E. N. Nikolaichik. *Stal'*, v. 17, Apr. 1957, p. 322-325. (*Henry Brutcher Translation* no. 3985.)

Nature of action of ultrasonic waves on liquids and gases; preliminary experiments on the casting of paraffin wax and stearin ingots; experimental set-up for casting under ultrasound; study of effect of ultrasound upon solidification of iron-carbon alloys; effect of ultrasound on macro and microstructures of steels and cast irons, on solubility of gases in them, and on mechanical properties. (D9, 1-24; ST)

225-D. Use of Vacuum in Ferrous Metallurgy. G. A. Garnyk. *Stal'*, v. 16, no. 7, 1956, p. 661-662. (*Henry Brutcher Translation* no. 3989.)

Data on quality improvement obtained with transformer iron, chromium-nickel stainless and constructional steels, high-purity molybdenum, ductile vanadium, carbon-free ferrochromium, manganese metal and chromium metal. Vacuum treatment of steel in main ladle compared with treatment in tundish and ingot molds. (D9m, 1-23; Fe, AY, SS)

226-D. Influence of Alkaline-Earth Metal Oxides Upon Distribution of Sulphur Between Iron and Iron-Containing Slag. L. A. Shvartsman, I. A. Tomilin, O. V. Travin and I. A. Popov. *Problems of Metallography and Metal Physics*, 4th Collection of Papers, 1955, Moscow, p. 577-594. (*Henry Brutcher Translation* no. 4001.)

Study of slag conditions most conducive to sulphur removal from liquid iron, with special reference to temperature dependence of the sulphur distribution equilibrium and the ifnluence of the oxides of Mg, Ca, and Ba on this equilibrium.
(D11n, 2-10; Fe, RM-q)

227-D. Influence of Sulphur Upon Interphase Tension at Metal-Slag Boundary. S. I. Popel, O. A. Esin, G. F. Konovalov and N. S. Smirnov. *Doklady Akademii Nauk SSSR*, v. 112, no. 1, 1957, p. 104-106. (*Henry Brutcher Translation* no. 4002.)

Data on equilibrium tension and dynamic tension during transfer of sulphur from metal to slag and vice versa. Change in form of metal drops (static interphase tension) with increasing sulphur (and oxygen) concentrations, and corresponding numerical values.
(D11n; S, RM-q)

228-D. (Russian.) **Mold Design for Continuous Casting of Steel.** G. I. Kol'tin and L. N. Koybalov. *Stal'*, v. 17, Mar. 1957, p. 209-213. (*Henry Brutcher Translation* no 4004.)

The use of a reciprocating mold permits elimination of sticking of the billets, increases uniformity of continuous casting and improves quality of the billet. Experience with new design has revealed the possibility of reducing weight and cost, increasing mold life and introducing automation.
(D9q, W19c, 1-2; ST)

229-D. Conveyor Machine for Continuous Casting of Steel. M. F. Goldobin. *Proceedings of the First All-Union Conference on the Continuous Casting of Steel*, Oct. 1955, 1956, Moscow, p. 111-118. (*Henry Brutcher Translation* no. 4005.)

Principle of machine conceived in 1946; billet moves together with, and at the same speed as, the mold; details on design and operation of machine; improvements made to machine since 1946; output data for 1950 to 1955. (D9q, 1-2; ST)

230-D. Projected Continuous Casting Machine According to Goldolin for Medium-Output Openhearth Steel Plants. G. A. Garbuz. *Proceedings of the First All-Union Conference on the Continuous Casting of Steel*, Oct. 1955, 1956, Moscow, p. 119-122. (*Henry Brutcher Translation* no. 4006.)

Proposed near-horizontal continuous casting machine to be erected at two Russian steel plants, with technical operating data as calculated. (D9q, 1-2; ST)

231-D. Questions Relating to the Application of Radioactive Isotopes in Metallurgy. (From the Moscow Conference on Experimental Techniques and Methods of High-Temperature Research.) E. Belyakova. *Soviet Journal of Atomic Energy*, No. 5, 1956, p. 850-851. (Translated by Consultants' Bureau, Inc.)

By means of radioactive isotopes, the following topics were investigated: kinetics of dephosphorization and desulphurization of metal by slag; movement of metal and distribution of alloying elements in openhearth furnaces; penetration of feeder head fluxes; contamination in ball bearing steel; segregation processes in steel ingot; self-diffusion of iron in the alloy with 3% Si.
(D11, 1-4; 14-13)

232-D. Investigation of Forces Acting on the Various Parts of a Continuous Steel-Casting Machine. V. F. Shchukin. *Stal'*, v. 17, no. 4, 1957, p. 320-322. (*Henry Brutcher Translation* no. 4022.)

Technique of measurements of (*a*) the forces resisting the withdrawal of the billet from the mold; (*b*) the pressure exerted by withdrawing rollers on the billet; (*c*) the torque on the universal spindles; and (*d*) the current, voltage and speed of electric motors.
(D9q, 1-2; ST)

233-D. How the Theory of Solidification and Crystallization Can Contribute to the Development of Continuous Casting. N. Chvorinov. *Hutnicke Listy*, v. 12, no. 3, 1957, p. 196-201. (*Henry Brutcher Translation* no. 4023.)

Previously abstracted from original. See item 147-D, 1957. (D9q, ST)

234-D. Refining of Steel With Oxygen in a Rotating Furnace by the "Kaldo" Process. B. Kalling and F. Johansson. *Jernkontorets Annaler*, v. 141, no. 4, 1957, p. 189-206. (*Henry Brutcher Translation* no. 4025.)

Report on the latest results (up to April 1957) obtained with the Kaldo steelmaking process. General features: furnace design and operation. (D10; ST)

235-D. (French.) **New Contribution to the Manufacture of Low Metalloid Content Thomas Steel.** P. Leroy, B. Trentini and E. Devernay. *Institut de Recherches de la Sidérurgie, Publications*, Ser. A, no. 124, Feb. 1957, p. 1-50. (Reprinted from *Documentation Metallurgique*, Spec. No. Sa 1, June 15, 1956, p. 12-61.)

Extensive experiments confirmed previous work on possibility of producing Thomas steel with very low nitrogen, phosphorus and sulphur content simply by using oxygen-enriched blast and appropriate oxidizing additions. New conclusions: thermal cycle of charge explains in large part fluctuations in final nitrogen content; low phosphorus content can be achieved by final thermal correction consisting of controlled additions of pulverized limestone flux for hot pours, ferrosilicon and lime for cold pours. 5 ref. (D3; ST)

236-D. (French.) **Continuous Reading of Temperature of the Melt in Controlling Smelting in the Thomas Converter.** B. Trentini, P. Leroy and M. Gombert. *Institut de Recherches de La Sidérurgie,* ser. A, no. 125, Oct. 1956, p. 1-26. (Reprinted from *Documentation Metallurgique,* Spec. No. So 1, June 1956, p. 62-87.)

Characteristics of temperature curve during final moments of dephosphorization, influence of temperature and chemical factors on nitridization of the melt studied with aid of two-color pyrometer. 20 ref. (D3d, S16, ST)

237-D. (Italian.) **The Linz-Donawitz Process: A New Method for Producing Steel.** *Fonderia,* v. 6, May 1957, p. 213-214.

Process fundamentals briefly indicated; types and properties of steels produced by LD oxygen blast process compared with those of Siemens-Martin steels; some applications of LD steels. (D10a; ST)

238-D. (Japanese.) **Desulphurization of Liquid Pig Iron With Calcium Cyanide.** Chiuyo Hisatsume and Yosisada Ueda. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 427-435.

Several kinds of liquid pig iron were treated with calcium cyanide in the amount of 0.5, 1.0, 1.5 and 2.0% to study desulphurization, carbon content and nitrogen content. Thermodynamic considerations discussed. 18 ref. (D11n; CI-a)

239-D. (Polish.) **Influence of Steel Mill Practices Upon Steel Ingot Cracking When Rolled.** Tadeusz Mazanek and Joseph Koza. *Hutnik,* v. 24, June 1957, p. 218-221.

Annual production results of one mill are discussed. Influence of melting, ingot cooling time, reheating time and ingot aging in the molds. 3 ref. (D9; ST)

240-D. (Russian.) **Study of Vanadium Slags Obtained in the Refining of Pig Iron.** A. Yu.Polakova and A. V. Rudneva. *Akademiya Nauk S.S.S.R. Izvestiya Otdelenie Tekhnicheskikh Nauk,* v. 4, Apr. 1957, p. 44-53. (CMA)

Vanadium-containing slags coming from pig iron refining operations are important substitutes for natural vanadium ores. Previous findings that the principal vanadium-containing compound in such slags is a "spinelide", a mineral with a spinel lattice in which vanadium and iron are partially replaced by trivalent chromium, aluminum and titanium, is confirmed. Since this spinelide remains solid at very high temperatures and, furthermore, it is insoluble in the silicates of the slag, the latter is very viscous and consequently unwieldy for treatment. 4 ref. (D11n; Fe, V, RM-q)

241-D. (Russian.) **Production of Aging-Resistant Steel.** I. S. Marakhovski and A. A. Podgorodeshkii. *Metallurg,* v. 2, May 1957, p. 11-13.

Killed, low-carbon steel containing aluminum, and rimmed steel containing vanadium, are recommended for auto bodies as being very little affected by aging. Chemical composition and manufacturing process of both steels. Better finish is obtained with the steel containing vanadium. (D general, N7e; ST)

242-D. (Russian.) **Vacuum Treated Electrosteel.** G. M. Borodulin. *Metallurg,* v. 2, May 1957, p. 16-18.

Advantages of vacuum application in production of electric steel; notes that it is possible to obtain steel containing 0.01-0.02% C and 0.004-0.005% S. Vacuum treated structural steel contains very few internal hair cracks. Hydrogen content can also be reduced. (D5g, 1-23; ST)

243-D. (Russian.) **Blast Furnace Performance With Oxygen Enriched Blast.** F. A. Khilkevitch, B. L. Lazarev and S. V. Bazilevich. *Metallurg,* v. 2, June 1957, p. 3-7.

A 2½ month run of the blast furnace with oxygen enriched blast is described. The process is not economical because of high price of oxygen and relatively low gain in cast iron output (around 6%). Application of oxygen enriched blast in production of ferromanganese is more successful since the output increases by 11.2%. (D1h; Fe)

244-D. (Russian.) **Deoxidation of Rimmed Steel in the Ladle With Ferromanganese.** D. S. Gertchikov, A. M. Ofengenden and L. M. Pokras. *Metallurg,* v. 2, June 1957, p. 13-15.

Product obtained is of uniform composition; silicon content is below 0.03%; low-carbon steels show no increase of carbon. The process is economical because the melt is 15 min. shorter and required quantity of the ferromanganese is greatly reduced. (D9m; ST, Mn, AD-n)

245-D. (Russian.) **Influence of Oxygen Content Upon Qualities of Soft, Rimmed Steel.** A. M. Potchman. *Metallurg,* v. 2, June 1957, p. 15-16.

Examination of 53 batches of soft, rimmed steel shows that the best stamping properties are obtained with oxygen content about 0.036-0.040%, and when the best aging properties are at 0.056-0.066% oxygen. (D11s; ST-d)

246-D. (Russian.) **Application of Agglomerate in Openhearth Melting.** N. A. Vetcher, A. A. Lebedev and L. D. Kornev. *Metallurg,* v. 2, June 1957, p. 17-19.

Openhearth process run for two years with total or partial replacement of the ore by the agglomerate shows that consumption of the agglomerate is 10% greater than that of the ore; amount of the slag increases with the amount of the agglomerate; time of smelting is reduced; iron oxide content in the slag increases; phosphorus content is reduced together with the required quantity of calcium and aluminum oxides. (D2, D11n; ST)

247-D. (Russian.) **Melting of Structural Steel in the Electric Furnace With Oxygen Blowing.** S. M. Gnuchev, V. P. Frantsov, G. F. Morenko, G. K. Kommissarov and Z. V. Klochkova. *Stal',* v. 17, Mar. 1957, p. 228-232.

When melting structural steels in electric furnaces, the use of oxygen during the oxidizing period in place of iron ore does not deteriorate the metal quality and does not decrease the durability of the furnace. 9 ref. (D5g; ST, SGB-s)

248-D. (Russian.) **Iron Balance in Blast Furnace Production.** L. L. Zusman and N. F. Sklokin, *Stal',* v. 17, Mar. 1957, p. 264-267.

Iron balance in blast furnaces indicates an improvement in the use of the raw materials and a general higher level of production knowledge. Introduction of progressive methods in the preparation of ores for smelting, technological processes and organization of production will secure a further reduction of the scrap metal. (D1b; Fe)

249-D. (Russian.) **Economic Appraisal of Steel Production Processes.** R. V. Bregman. *Stal',* v. 17, Mar. 1957, p. 268-272.

Tables comparing power and costs for converter and openhearth; it is concluded that it is expedient to place the converter right beside the openhearth furnaces, and that the converter should operate with compressed oxygen fed from above. This will guarantee a considerable improvement of the quality of the converter steel. (D3, D2, 17-3; ST)

250-D. (Russian.) **Concerning the Automation of the Horizontal Distribution of the Burden in the Blast Furnace.** P. N. Grekov and V. K. Gruzinov. *Stal',* v. 17, Apr. 1957, p. 300-304.

Application of the burden distributor with an intermediate revolving hopper, as proposed by A. S. Aiukov, facilitates controlling the horizontal distribution of materials. (D1a, 18-24; Fe)

251-D. (Russian.) **Preliminary Data on the Application of the Converter Process to Chalil Iron.** S. G. Afanasev, M. M. Shumov, Z. D. Epshtein, T. V. Andreev, M. P. Kvitko and G. V. Gurskii. *Stal',* v. 17, Apr. 1957, p. 310-317.

Tables and drawings of furnaces for duplex process (basic converter-electric furnace or basic converter-openhearth), as well as for the mono-process of a converter operating with oxygen blast to produce high-quality steel directly. (D7a, D3f; ST)

252-D. (Russian.) **Lined Metal Hot-Tops.** I. S. Tkachev. *Stal',* v. 17, Apr. 1957, p. 318-319.

The replacement of ceramic floating hot-tops by lined steel hot-tops, when pouring killed steel, produces substantial economic effect due to high durability of the new design hot-tops and reduction of metal losses. (D9p, W19e, 1-2; ST-c)

253-D. (Russian.) **Investigation of Stress Effects Upon the Assembled Installation of Continuous Casting of Steel.** V. F. Shchukin. *Stal',* p. 17, Apr. 1957, p. 320-322.

An investigation of stress effects upon assemblies of an installation for continuous casting of steel shows regular fluctuations along the billet. To decrease the most dangerous stresses, it was found expedient to employ an oscillating frame for suspension of the mold, which eliminated the lateral pressure of the billet. (D9q, 1-2; ST)

254-D. (Russian.) **An Investigation of Longitudinal Cracks on Railroad Rail Flanges.** V. A. Nikitskaya and A. M. Karpunin. *Stal',* v. 17, Apr. 1957, p. 347-351.

Elimination of longitudinal cracks by controlling speed of pouring the ingot and the fluidity of the metal, and in particular by top pouring of the ingot, which permits improvement of the macrostructure of the ingot bottom.
(D9p, M28h, T23q, 9-22)

255-D. (Swedish.) **L-D Process.** Hubert Hauttmann. *Jernkontorets Annaler,* v. 141, no. 6, 1957, p. 332-349.

Description of Austrian plants; properties of the steel in comparison with that of other processes. 12 ref. (D10a; ST)

256-D. Granite City Steel Co. a Provider of Iron and Steel Since 1878. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 45, Aug. 1957, p. 858-878.

Capacity, dimensions, layout and operation of coke oven, blast furnaces, openhearth, slabbing mill, strip mill, sheet and strip finishing facilities. (D general, F23, 1-2; ST)

257-D. Furnace Pressure and Heat Transfer. C. H. Stone. *British Steelmaker,* v. 23, Aug. 1957, p. 246-249.

Report of tests to determine effects of pressure on heat transfer, which entail raising pressure in openhearth furnace and working with short flames. (D2h)

258-D. Rotary Oxygen Steel Making Developed in Sweden. Bo Kalling and Folke Johansson. *Canadian Metalworking,* v. 20, July 1957, p. 42-45.

Stora Kal-Do rotary oxygen process uses 30-ton rotating furnace and 2300 cu. ft. of oxygen per ton of hot metal for refining high-phosphorus pig iron; process operations and advantages. (D10; ST, CI-a)

259-D. Simulation Technique. *Castings,* v. 3, May 1957, p. 19-20.

Note on technique using stearin wax castings to simulate conditions occurring during solidification of steel ingots. Effect on piping of gas evolution and cooling rate in wax castings. (D9; ST, 9-17)

260-D. Use of Sinter at Dorman Long Steel, Ltd. A. Ledgard, D. Rist and P. K. Gladhill. *Iron and Coal Trades Review,* v. 175, Aug. 2, 1957, p. 249-258.

Performance of the blast-furnace plants of Dorman Long Steel, Ltd., improved as sinter was progressively introduced into the burden and then deteriorated notably when owing to a mishap, the production of sinter was temporarily diminished.
(D1; Fe)

261-D. Air Assisted Openhearth Combustion. Some Russian Experiments. S. N. Bystrov and A. A. Dobrokhotov. *Iron and Coal Trades Review,* v. 174, May 3, 1957, p. 1028-1030. (Translation from *Stal',* v. 16, no. 7, June 1956, p. 597-601.)

Previously abstracted from original. See item 327-D, 1956. (D2, ST)

262-D. Vacuum Treatment of Steel in Russia. Experiments on Bessemer and Electric Steels. A. M. Samarin, L. M. Novik, N. I. Goncharenka and A. F. Tregubenko. *Iron and Coal Trades Review,* v. 174, May 10, 1957, p. 1075-1077. (Translation from *Stal',* v. 16, no. 8, Aug. 1956, p. 700-707.)

Previously abstracted from original. See item D-334, 1956.
(D8, Q general, ST)

263-D. Russian Basic Roof Experience. R. Sewell. *Iron and Steel,* v. 30, Aug. 1957, p. 389-391.

Report of Inter-Works School for the Study of Basic Roofs on openhearth roof life, furnace productivity and operational conditions. (To be continued.) (D2, 1-2; RM-h)

264-D. Development of Controlled Air Distribution for the Blast Furnace. J. M. Stapleton. *Iron and Steel Engineer,* v. 34, July 1957, p. 137-140.

Blast distribution before tuyere redesign; functioning of automatically controlled air proportioning system; evaluation of effect of air proportioning installation on furnace performance and lining life. (D1, 1-2)

265-D. Continuous Casting at Atlas Steels Ltd. L. F. Banrhardt, G. E. Stock, and W. U. Porter. *Journal of Metals,* v. 9, Aug. 1957, p. 1050-1051.

Procedures employed in operating North America's first commercial steel casting machine at Atlas Steel Ltd., Welland, Ont. (D9q; ST)

266-D. British Steelmaking Today and Tomorrow. D. J. O. Brandt. *New Scientist,* v. 2, Aug. 8, 1957, p. 14-17.

Traditional British methods contrasted with new and old Continental processes. (D general; ST)

267-D. Some Major Advances in Blast Furnace Practice. S. N. Sircar. *Science and Culture,* v. 22, May 1957, p. 588-594.

Historical review; survey of modern practice. 20 ref. (D1, A2)

268-D. Chemical Capping Cuts Drawing Rejects. John S. McNairn. *Steel,* v. 141, Aug. 26, 1957, p. 76-78.

Chemical capping of rimming steel ingot cut down percentage of scrap and gave uniform chemistry at Ford steel plant. (D9k; ST-d)

269-D. More Jobs Open for Rare Earth Additives. *Steel,* v. 141, Sept. 9, 1957, p. 112-115.

Addition of 5 lb. of misch metal per ton of stainless steel in the ladle results in improved strength and ductility, control of tramp elements, decrease in scrap losses, grain refinement and a saving of $80 per ton of steel. (D9r; SS, EG-g)

270-D. Heat Over Checkers Speeds Light-Up. *Steel,* v. 141, Aug. 19, 1957, p. 158-161.

Burning gas on top of checkers can cut 6 to 12 hr. off time needed in lighting openhearth furnace.
(D2h)

271-D. (French.) **Chronicle of Steelmaking. From Carbon Steel to Electric Steel.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3501, Feb. 1957, p. 91-92.

Historical listing and brief comment on processes and equipment.
(D general, A2; ST)

272-D. (French.) **Chronicle of Steelmaking. Application of Concentrated Oxygen in the Manufacture of Steel.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3502, Mar. 1957, p. 147-149.

Summary of first uses of concentrated oxygen after World War I and of developments in use of different types of furnaces and in different countries. 10 ref.
(D10; ST)

273-D. (French.) **Partial Replacement of Metallurgical Coke by Reducer Gas in Blast Furnaces.** Ladislas Naszalyi. *Revue de l'Industrie Minerale,* v. 39, May 1957, p. 423-435.

On basis of uncompleted experimental work with small furnace (approx. 16 ft. high by 23 ft.), at least one way was found to reduce quantity of coke previously required for ore reduction. 8 ref.
(D1b; Fe, AD-r, RM-j 43)

274-D. (German.) **Influence of Hydrogen Additions to Reducing Gas on the Increase of Degree of Reduction of Indigenous Iron Ores.** Horst Braun and Kurt Wachtl. *Neue Hütte,* v. 2, June 1957, p. 333-340.

Ores tested; softening points in air and in the reducing gas flow; gases used; sampling; determination of the degree of reduction; test data and analysis; comparison of values calculated; critical consideration of thermodynamic calculations; effects upon blast furnace operation. 16 ref.
(D1b, D11g; Fe, RM-n)

275-D. (German.) **Porosity of Steel Ingots 300 Kilos in Weight of C22 Quality Used for the Production of Wheel Disks.** Georg Wycisk and Otto Kramer. *Neue Hütte,* v. 2, June 1957, p. 341-346.

Pore formation; influence of melting method; influence of deoxidation; influence of the killing time in the furnace after previous deoxidation; tapping time; influence of furnace conditions and pouring methods. (D9, D general; ST, 5-9, 9-18)

276-D. (German.) **Influence of Steel Impurities on the Remagnetization Losses of Hot Rolled Transformer Sheets.** Theodor Brüggemann. *Neue Hütte,* v. 2, July 1957, p. 404-409.

Manufacturing transformer steel; sheet bar and sheet treatment in the rolling mill; description of unsuitable transformer steel treatments in the rolling mill and annealing department. 5 ref.
(D general, F23, P16; ST, 4-3)

277-D. (German.) **Crude Coal Tar Firing of Openhearth Furnaces.** Wilhelm Gerling and Karl-Otto Zimmer. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1075-1080.

Appearance of the crude tar flame in the furnace using the Stec-Blaw-Knox burner, with atomization by preheated compressed air at 200° C. and 6 atmospheres; capacity and consumption figures of the tar-fired furnace; influence of the crude tar use on the melting process; difficulties encountered in operation and their removal; sulphur contents of the melt in triple-gas fired furnaces compared with those in the furnace fired with crude tar; differences in the behavior of the crude tar-fired furnace as against that of of a gas-fired furnace.
(D2, 1-2; RM-j, RM-m)

278-D. Oxidation of Liquid Steel During and After Tapping From an Openhearth Furnace. N. S. Mikhailets. *Stal',* v. 16, 1956, p. 214-216. (*Henry Brutcher Translation* no. 3822.)

Magnitude of loss of deoxidizers (and alloying elements) owing to oxidation outside the openhearth furnace; numerical data on manganese losses in rimming plain carbon steels inside and outside the furnace; detection of the point at which most of this external loss occurs; effect of duration of tap upon total manganese and silicon losses; importance of the conditions of tapping, especially the state of the taphole which controls the duration of the tap as well as the character of the stream of metal being run out of the furnace. (D9n, D2; ST)

279-D. (Book.) **Boron, Calcium, Columbium, and Zirconium in Iron and Steel.** Engineering Foundation. 533 p. 1957. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $14.

Fourth book in the Alloys of Iron New Monograph Series. Collection of four monographs on effects of these alloying metals on iron and steel. Monographs separately abstracted.
(D11, 2-10; ST, *B, Ca, Cb,* Zr)

E Foundry

384-E. The CO_2 Process of Producing Moulds and Cores. C. Sargent. *British Steelmaker,* v. 23, July 1957, p. 202-205.

Requirements, techniques and advantages of process in casting Ni-Cr alloy steels, ranging from 18-8 austenitic stainless to 60-20 Ni-Cr heat resistant steels. (E19, E21; SS)

385-E. Use of Sieve Analysis in Determining Surface Area of Sand. Robert E. Morey. *Foundry,* v. 85, Aug. 1957, p. 100-101.

Good approximation of surface area by formula involving grain fineness number, volume, density and surface shape factor. (E18r)

386-E. Patterns. Harry St. John. *Foundry,* v. 85, Aug. 1957, p. 105-107.

Techniques employed in patternmaking; materials for, and types of, patterns. (E17)

387-E. Air-Setting Process. Daniel R. Chester and William E. Mahoney. *Foundry,* v. 85, Aug. 1957, p. 110-113.

Theories, fundamentals, advantages, disadvantages of the process. (E18)

388-E. Steel Foundry Uses New CO_2 Gassing Techniques. D. C. Ekey and E. G. Vogel. *Foundry,* v. 85, Aug. 1957, p. 134-138.

To evaluate new vacuum chamber gassing machine tests were conducted to compare vacuum machine-gassed with hand-gassed cores for as-gassed early strength and standing strength to determine if a physical difference existed between cores vacuum machine-gassed in the box and those vacuum machine-gassed after stripping; and to determine effect of heated CO_2 on core quality and curing speed. (E21g; ST)

389-E. Reverse-Flow Heating in Core and Mold Ovens. Carl Mayer, Jr. *Foundry,* v. 85, Aug. 1957, p. 174-176.

"Reverse flow" heating can be done in two ways; preferred method is to discharge the hot air through headers in the roof over the load and recirculate it through a trench or pit in oven floor. (E21h)

390-E. Uses of Cast Iron and Other Materials as Denseners in the Production of Machine-Tool Castings. Brian Kirby. *Foundry Trade Journal,* v. 102, June 20, 1957, p. 749-754.

Effect on structure and hardness of using cast iron drills for rapid cooling of thick sections of iron castings; advantages of cast iron and silicon carbide compared as material for chill. (E22r; CI)

391-E. Pouring of Investment Castings. M. Riddihough. *Foundry Trade Journal,* v. 102, June 20, 1957, p. 761-762.

Furnace hearth shape, rate of pouring and design of investment mold are considered in the quality control of investment castings. (E15, E23)

392-E. Arc-Furnace Studies. *Foundry Trade Journal,* v. 103, July 25, 1957, p. 111-112.

Effects of power input on electricity consumption, melting time and electrode consumption. Rate of wear of firebrick and silica roofs. (E10r, 1-2; RM-h)

393-E. Vacuum Die Casting Processes. H. K. and L. C. Barton. *Machinery,* v. 91, July 26, 1957, p. 211-220.

Evacuation systems, including enclosure of whole die system; evacuation by way of ejector housings and use of hoods to enclose die and bolster. (E13, 1-23)

394-E. Design of Die Castings and Die-Casting Dies. Pt. 5. W. M. Halliday. *Machinery Lloyd,* v. 29, June 8, 1957, p. 70-74.

Considers fixed solid cores, movable cores, sprued channels and sprue dividers in die-casting die design. (E13, W19n, 17-1)

395-E. 17-4 PH Castings—Strong and Corrosion Resistant. David C. Ekey and E. V. Black. *Materials in Design Engineering,* v. 46, July 1957, p. 105-107.

Heat treatment, mechanical properties, design requirements to eliminate surface cracking in machining and welding. Frequency distribution and probability graphs of properties with relation to precipitation hardening. (E11, J general, Q general, R general; SS, 9-22)

396-E. Casting of Titanium May Be Possible Soon. *Materials in Design Engineering,* v. 46, July 1957, p. 166, 168. (CMA)

Research progress relating to melting furnaces, mold materials and casting alloys. Best molds now are obtained from graphite; mold life may extend to 50 castings if draft is adequate, re-entrant angles are absent and expendable inserts are used. Skull melting furnaces look promising. Superheating melts allows the gating system to be small. (E general; Ti)

397-E. Design of Die-Castings. H. K. Barton. *Metal Industry,* v. 91, July 19, 1957, p. 43-45.

Compares relative advantages of zinc, aluminum, magnesium and copper alloys as materials for pressure die castings. (To be concluded.) (E13, 17-1; Zn, Al, Mg, Cu)

398-E. Foundry Metallurgy. Alfred H. Hesse. *Metal Progress,* v. 72, Aug. 1957, p. 73-75.

American Foundrymen's Society hears that aluminum castings can be improved by sharply limiting the iron content. Die castings, vacuum melted, may compete with stampings. Graphite is, so far, the only practicable mold material for titanium. Tin (up to 0.10%) seems advantageous to gray iron—contrary to its popular reputation. Calcium is also the preferred element for inoculation of gray cast iron. (E general)

399-E. Die Casting Aluminum and Zinc. Pt. 2. *Modern Metals,* v. 13, July 1957, p. 74-84.

Zinc and aluminum alloy selection, alloying practices, melting and metal handling, remelting, scrap handling, foundry practices and inspection. (E13; Al, Zn)

400-E. Die Face Mould Coatings for Die Casting Dies. T. E. Murray. *Tooling and Production,* v. 23, Aug. 1957, p. 91-92.

Functions and requirements of lubricants and mold coatings for casting specific metals. (E13, W19n, 1-3; NM-h)

401-E. (French.) **30th Foundry Congress of the Association Technique de Fonderie at Paris.** *Métallurgie et la Construction Mécanique,* v. 89, July 1957, p. 633-641.

Abstracts of papers submitted on the following subjects; influence of the force of blast on the cupola operation; new recuperating plant for blast heating; modernization of foundries; the CO_2 process; aging of core sands; statistical control; causes and formation of pits; determination of feed cross-sections for moldings; spheroidal graphite cast irons; nonmagnetic cast iron; nickel-copper-chromium cast iron; graphitizing with salt baths; study of ingot molds. (E general; CI)

402-E. (German.) **Aluminium Pressure Die Castings for Internal Combustion Engines and Vehicles.** C. Bücken. *Aluminium,* v. 77, July 25, 1957, p. 525-536.

Special advantages of pressure-die castings in light metals; ease of shaping, satisfactory production conditions and high value of scrap; the present status of aluminum use in various vehicles; use of light-metal pressure die castings for cylinder blocks, engine housings, clutch and gear castings, pistons and cylinder heads. Many parts of the passenger car chassis bodywork and suspension can also be made of aluminum pressure die castings, such as wheels and hubs, parts of the brake equipment, fuel tanks, exhaust silencers, parts of the steering mechanism and door frames. (E13, W11j, 17-7; Al)

403-E. (German.) **Manufacture and Use of Large Aluminum Die Castings.** A. F. Bauer. *Giesserei,* v. 44, July 18, 1957, p. 421-437.

Rapid growth of aluminum die casting; development of large structural parts; new large die casting machines and automatic ladling devices; large die casting dies; design for large die castings; variables in aluminum die castings and their control; future prospects. (E13, 1-2; Al)

404-E. To Conduct Research in and Promote Development of Production of Titanium Alloy Castings for Ordnance Application. Final Technical Reports. Rem-Cru Titanium, Inc. (Watertown Arsenal Laboratory, Report 401/104-20.) *U. S. Office of Technical Services,* PB 127334, 44 p. (CMA)

Work discussed in three other reports summarized, covering construction of skull arc melting furnaces of the bottom-pour and tilt-pour designs, and the pouring and casting of titanium shapes and their as-cast properties. The castings were sound, strong, tough, good-surfaced and accurately dimensioned. Both machined graphite and carbon molds serve. Development of cheap molds of powdered carbon and graphite shows promise. (E10r, E23; Ti)

405-E. Continued Research and Development of Titanium Castings: Final Report. Rem-Cru Titanium, Inc. (Watertown Arsenal Laboratory, Report 401/208.) *U. S. Office of Technical Services,* PB 127336, 195 p. (CMA)

Melting and casting studies performed with Ti-7Al, Ti-7Mn and Ti-4Al-4Mn. Impact values versus tensile strength at 40 and 70° F. obtained. All castings had good chemical homogeneity. (E general, Q general; Ti)

406-E. (French.) **Sulphur in Cast Irons.** Oliver Bader and Daniel Godot. *Fonderie,* no. 137, June 1957, p. 241-245.

Theoretical considerations on the chemical affinities of sulphur; morphology of its combinations and their

influence on the constituents of cast iron; various methods of countering the action of sulphur by neutralization and by desulphurization process of producing a resistant iron with high sulphur content. 20 ref.
(E25; CI, *S*)

407-E. (French.) **Recent Progress in Sand Removal.** George Cros. *Fonderie*, no. 137, June 1957, p. 255-259.
Current processes and equipment employed in cleaning castings.
(E24)

408-E. (German.) **Tests on Sand Mixers and Centrifuges.** Waldemar Gesell. *Giesserei*, v. 44, July 4, 1957, p. 397-404.
Definition of "mixing"; classification of mixers; cooling effect of centrifuges; reducing the size of the sand grain. 9 ref. (E18p, 1-2)

409-E. (German.) **Results Obtained in the Operation of a New Mulling System for Preparing Foundry Molding Materials.** Theodor Klingenstein and Peter Pilz. *Giesserei*, v. 44, Aug. 1, 1957, p. 453-457.
The rotary muller; testing mulling efficiency; definition of the mulling quality; savings in binders.
(E18p, 1-2)

410-E. (German.) **A New Process of Chilling the Surfaces of Castings in the Mold.** Erwin Knipp. *Giesserei*, v. 44, Aug. 1, 1957, p. 467-469.
Chilling with chill-molds; chilling with link chains. (E22r)

411-E. (Italian.) **Mechanized Molding.** G. Somigli. *Fonderia Italiana*, v. 6, Mar. 1957, p. 97-105.
Technological developments during past decade, with detailed reference to modern equipment in Italian foundries. Sandslingers are widely used, receive special attention herein. Mechanized molding, to be worthwhile, requires mechanization and rational organization of other foundry operations.
(E19, 1-2, 18-24)

412-E. (Italian.) **Natural and Synthetic Clays and Sands.** E. Moltoni. *Fonderia Italiana*, v. 6, Mar. 1957, p. 106-110.
Developments during past ten years in control of sand and clay characteristics and properties. Discussion of core sands, zircon sands, CO_2 process, core ovens, both infrared and dielectric heating types.
(E18, E21h)

413-E. (Italian.) **Special Molding Processes.** V. Di Sambuy. *Fonderia Italiana*, v. 6, Mar. 1957, p. 119-120.
Capaco, Corning, Shaw, "Glascast", CO_2, "Accuracore", "Cermaform", lost wax, "Mercast", Metropolitan Vickers, Brake Shoe processes. (E16)

414-E. (Italian.) **Foundry Operations in a Naval Repair Yard.** Ernesto Bosio. *Fonderia Italiana*, v. 6, June 1957, p. 237-239.
Special problems of foundry work in a shop where deadlines, vessel safety and variety of jobs are controlling factors; methods adopted to expedite work.
(E general, T22, 18-22)

415-E. (Italian.) **Improvements in the CO_2 Process.** Paul Williame. *Fonderia Italiana*, v. 6, June 1957, p. 240-242.
Method of controlling metering of CO_2. (E18n)

416-E. (Japanese.) **Solidification Process of Magnesium Cast Iron.** Katsuya Ikawa. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 213-214.
Graphite spheroidization process of magnesium treated cast iron.
(E25n; CI-r, *Mg*)

417-E. (Japanese.) **Tellurium Addition to Chilled Cast Iron.** Toshiaki Ohmi. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 214-215.
Surface hardening of tellurium cast iron; time and temperature effects; chill effect.
(E22r, 2-10, CI, *Te*)

418-E. (Japanese.) **Study on Blowholes in Castings.** Hiroshi Yamaoka. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 221-222.
Measurement of mold back-pressure and strength of solidified film on castings. (E25n; 9-18)

419-E. (Japanese.) **Causes of Scab. Report 3. When, Where and Why It Occurs.** Keizo Nishiyama. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 222-227.
Relationship of casting temperature, casting speed, mold hardness and moisture of foundry sand to scab, rat-tail and veining formations. (E11, 9-21)

420-E. (Japanese.) **Study of High-Temperature Melting of Cast Iron. Report 3. Effect of Alkali Metal and Alkali Earth Metal Fluorides.** Takao Shibata. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 227-228.
Alkali metals and alkali earth metal fluorides have stronger reduction properties than carbonates in molten iron; dissociation pressure, viscosity, moisture effect and reaction product resulting from the addition of metal fluorides at high temperatures. 3 ref. (E25n; CI)

421-E. (Japanese.) **Study of Metal Flow by Means of Colored Paraffin. Report 7.** Kenji Chijiwa. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 228-229.
Metal flow studies in cylinders, plates and rings. (E25p)

422-E. (Japanese.) **Determination of the Melt Quality of 85-5-5-5 Red Brass.** Shigeo Oya. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 230-231.
Effect of impurities (aluminum and silicon) examined by means of chilled test pieces. Charpy impact test was applied on test pieces to determine grain size.
(E25n, Q6, 3-19; Cu-n)

423-E. (Japanese.) **Structural Changes of Cast Iron in Vacuum Melting.** Reiichi Ohno. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 236-237.
Reduction of oxygen, oxides and sulphur by vacuum melting; thermodynamic interpretation of the reduction; structure in relation to reduction of oxygen and sulphur.
(E10, 1-23; CI)

424-E. (Japanese.) **Structural Changes of Cast Iron, in Contact Melting With Various Oxides.** Reiichi Ohno. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 237-238.
Molten steel and iron are mixed with oxides such as refractory materials and slags; effect on structure, graphite and sulphur studied.
(E25; CI)

425-E. (Japanese.) **Addition of Metals and Alloys for Spheroidal Cast Iron.** Takaji Kusakawa. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 239-240.
Spheroidization of cast iron by the addition of magnesium, calcium and misch metal; experimental magnesium and magnesium alloys are most suitable.
(E25q; CI-r, AD-p36, *Mg*, *Ca*, EG-g)

426-E. (Japanese.) **Shape of Temper Carbon in White Cast Iron Made by Magnesium Addition.** Akio Sera. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 240-241.
Change of graphite shape caused by the addition of magnesium, by varying the cooling rate and by different mold materials.
(E25q; CI-p, *Mg*)

427-E. (Japanese.) **Producing White Cast Iron by Gas Decarburization.** Isamu Takeda. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 242-244.
Manufacture of white heart malleable cast iron with air or water vapor as the decarburizing agent; effect of temperature of air and water vapor and time of decarburization. (E11; CI-p)

428-E. (Japanese.) **Annealability of White Cast Iron.** Masayoshi Iwase. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 244-246.
Manufacture of white cast iron; melting operation; effect of gas composition on graphitization.
(E11; CI-p)

429-E. (Japanese.) **Studies on Cupolas; Relation Between Flow of Wind and Chemical Reactions in Cupola.** Toru Ishino. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 246-248.
Properties of coke and its chemical reactions; relation between wind of flow and size of tuyére.
(E10a; CI)

430-E. (Japanese.) **Study of High-Strength Cast Iron.** Kokichi Nakamura. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 256-257.
By utilization of oxygen blowing, high-strength cast iron is obtained. This high quality is brought about by reduction of carbon and silicon. Relation between tensile strength, depth of chill, volume of oxygen blown studied. (E25; CI-c)

431-E. (Japanese.) **Study on the Mulling of Molding Sand. Report 3.** Saburo Katashima. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 260-261.
Study of mulling time, size of sand, clay content. (E18p)

432-E. (Japanese.) **Sand Mold Binders. Reports 9 and 10.** Toshisada Makiguchi. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 261-266.
Study of organic sand and clay mold binders, their chemical composition and thermal decomposition; effect of oxidation of binders on cast iron surface. (E18n)

433-E. (Japanese.) **Poval as a Foundry Sand Binder.** Ryojiro Kono. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 266-267.
Pressure resistance properties of sand at various temperatures; characteristics of polyvinyl alcohol as a binder. (E18n)

434-E. (Japanese.) **Experiments on Dry Mold Sand for Steel Castings.** Hiroshi Akimoto. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 267-268.
Effect on mold sand strength of addition of bentonite, percentage of water, time of mixing and sand size distribution. (E19b; ST)

435-E. (Japanese.) **Pinholes and Moisture Absorption of CO_2 Cores.** Shiosuke Sato. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 269-272.

Absorption properties of cores in relation to pinhole formation during the casting. (E18n)

436-E. (Japanese.) **Research on the Hot Permeability of Molding Sand. Report 2.** Hiroshi Yamamoto. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 273-274.

Diffusion of gas through molding sand, synthetic sands at different temperatures. 4 ref. (E18r)

437-E. (Japanese.) **Elevated Temperature Tests on Foundry Sands.** Yoshio Kuroda. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 274-275.

Drawbacks of American Society for Testing Materials' elevated-temperature tests on foundry sand and suggested improvements. (E18r, 2-12)

438-E. (Japanese.) **Study of Molding Materials. Report 3 and 4.** Yoshiharu Isono. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 275-278.

Influence of moisture and drying temperature on high-temperature properties of molding sands such as fluidity, moldability, heat transfer, permeability and strength. (E18r, 2-12)

439-E. (Japanese.) **High-Temperature Properties of Molding Materials. Pt. 2.** Kunio Futaki. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 278-280.

Phenomena of expansion of the molding sand in contact with molten metal; relation between exposure time and expansion for different molding sands. (E18r, 2-12)

440-E. (Japanese.) **High-Temperature Properties of Molding Materials. Pt. 3. Effect of Binders.** Kunio Futaki. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 280-282.

Binding materials studied were bentonite, dextrin, pitch and carbon black; strength of mold versus temperature investigated. (E18n, 2-12)

441-E. (Japanese.) **Heat Absorption of Mold and the Soundness of Casting. Report. 3.** Morio Takahashi. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 287-289.

Shapes of pipes and process of pipe formation; mathematical conception of pipe formation. (E25n, 9-17)

442-E. (Japanese.) **Effect of Vibration During Solidification of Castings.** Hidesuke Niiyama. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 289-291.

Study of solidification under effect of vibration for refining the crystal grain size and eliminating pinholes. It is suggested that strength of shock is a more important factor than vibration. 7 ref. (E25n, E25q)

443-E. (Japanese.) **Heat Transfer of Sand Molds—Influence of Binder.** Eiichi Matsumura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 291-292.

The heat conduction of molding sand at various temperatures and with different binding materials; heat conduction varies with water content and grain size of sand. (E18n, P11k)

444-E. (Japanese.) **Study on Blowholes in Castings. Report 2.** Hiroshi Yamaoka. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 302-303.

Investigation of blowholes in relation to gas pressure in the shell molding process; blowholes versus thickness of shell mold; effect of the addition of resins. (E16c: 9-18)

445-E. (Japanese.) **CO_2 Molding Process. Report 2.** Niichi Minamimura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 303-304.

Experimental investigation of carbon dioxide efficiency; amount of carbon dioxide absorbed, amount dissipated in molding sand, amount necessary for binding the sand. (E18n)

446-E. (Japanese.) **Magnesium Addition in Making Spheroidal Cast Iron.** Kunio Okabayashi. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 313-314.

The main effect of magnesium addition to cast iron is the promotion of spheroidal graphite; the mechanism causing the increase of spheroidal graphite. (E25q; CI-r, AD-p36, *Mg*)

447-E. (Japanese.) **Influence of Oxygen and Nitrogen in the First Stage Graphitization of White Cast Iron.** Taira Okamoto. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 318-320.

Effect of red-lead, potassium ferrocyanide and aluminum on graphitization. (E25q, 2-10; CI-p)

448-E. (Japanese.) **Fundamental Experiments on the CO_2 Process.** Yasuji Kataura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 329-331.

Fundamental concept of the carbon dioxide process; strength of molding material and core at room temperature; permeability of carbon dioxide in molding sand. (E18

449-E. (Japanese.) **Methods of Sand Analysis.** *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 452-460.

Analysis by pressure, specific gravity and colorimetry, especially the use of nickel ion in colorimetry. (E18r)

450-E. (Russian.) **Study of the Durability of the Molds at the Kuznetsk Metallurgical Combine.** A. V. Plankina. *Stal',* v. 17, Apr. 1957, p. 362-365.

Slowing down mold cooling after casting proved to increase the durability; practice of using top-poured molds indicated that the application of the double-stopper pouring leads to lowering of the mold durability. (E19)

451-E. Aluminium Casting Alloys in Great Britain. F. H. Smith. *Castings,* v. 3, May 1957, p. 7-14.

Historical development of different aluminum casting alloys and beginning of official standards. 7 ref. (E general; Al)

452-E. Zircon Sand—A Valuable Foundry Tool. *Castings,* v. 3, June 1957, p. 7-9.

Compares physical properties of zircon and silica sand and suggests zircon mixtures for use in cores, green sand and dry sand molding. (E18r)

453-E. How to Use Olivine Sand. W. A. Snyder. *Foundry,* v. 85, Sept. 1957, p. 100-105.

Lower cleaning costs and reduced machining time result when used for manganese steel castings. Application and sand mixtures for molds, cores, ladle linings and washes. (E18; AY, *Mn*)

454-E. Testing Procedures in the Brass Foundry. Harry St. John. *Foundry,* v. 85, Sept. 1957, p. 116-119.

Day-to-day quality control: test bar method, fracture evaluation, Brinell testing and radiography. (E25, S13; Cu)

455-E. Hot Cracks and Tears in Malleable Iron Castings. R. W. Heine and F. W. Jacobs. *Foundry,* v. 85, Sept. 1957, p. 120-125.

Factors which when combined with normal contraction cause tears and cracks: feeding of the casting, stability of mold and molding sand, cores, casting design and miscellaneous causes. Classification and discussion of types of tears or cracks. 3 ref. (E25; CI-s, 9-22)

456-E. New Molding Process Makes Close-Tolerance Castings. James W. Hamblen. *Foundry,* v. 85, Sept. 1957, p. 138-139.

Carbon dioxide process is adapted to a semi-precision mold-making method, resulting in relatively thin molds comparable in dimensional accuracy and finish to shell molds. (E19)

457-E. Wax Models for Use in the Investment-Casting Process. E. H. G. Sargent. *Foundry Trade Journal,* v. 103, Aug. 1, 1957, p. 123-131.

Reviews waxes used from antiquity to present-day formulations; chemistry of waxes, additives, desirable physical properties, faults in wax patterns, recommendations for choosing wax for investment casting. 33 ref. (E15, NM-d32)

458-E. Scandinavian Foundry Review. *Foundry Trade Journal,* v. 103, Aug. 1, 1957, p. 133-139.

Processes and equipment used in two Danish iron foundries. (E11, 1-2; CI)

459-E. Minutes From Melt to Mold. Alan L. Colter. *Instrumentation,* v. 10, no. 4, July-Aug. 1957, p. 4-7.

Chevrolet Division's new foundry sets fast pace for production of engine castings; instruments help in cupola operation, sand and core drying. (E11, X general)

460-E. Mold Treatment: the Key to Quality Castings. Hubert Chappie. *Iron Age,* v. 180, Aug. 15, 1957, p. 98-101.

Emphasizes importance of careful drying, wash application, closing of cope and drag, pouring of molds for large steel castings. (E19; ST)

461-E. Investment Casting Defects. A. Hegarty. *Iron and Steel,* v. 30, Aug. 1957, p. 411-413, 418.

Causes and prevention of dip-coat spalling, dip-coat buckling, core shift, binder penetration, slag inclusions, scabbing, gas defects, oxide fold, shrink conditions, cold shut and mold crack. (E15, 9)

462-E. Ethyl Silicate Moulds. A. Torry. *Iron and Steel,* v. 30, Aug. 1957, p. 414-418.

Brief review of casting processes, with emphasis on "Truprocess" method of die preparation which incorporates the "Shaw" process of investment molding. (E15; ST)

463-E. Molds for Titanium. F. W. Wood and R. P. Adams. *Light Metal Age,* v. 15, Aug. 1957, p. 18-20.

Problems in titanium casting; use of water-cooled copper crucible and a water-cooled graphite crucible; lamination of molds to simplify machining and minimize breakage replacement. 4 ref. (E12, W18c, W19g, 1-2; Ti)

464-E. Design of Die-Castings. Pt. 1. The Scope of the Die-Casting Process. H. K. Barton. *Metal Industry,* v. 91, July 26, 1957, p. 67-68.

Relative strength of zinc, aluminum or magnesium-base die casting alloys and importance of this in die casting design. (E13, 17-1, Q27a; Zn, Al, Mg)

465-E. Choosing Alloys for Die Casting. W. Wolf. *Metal Treatment and Drop Forging,* v. 24, July 1957, p. 272-276.

Average composition and casting properties of tin, lead, zinc, aluminum, magnesium and copper die casting alloys and properties of interest to the user of die castings. (E13; Sn, Pb, Zn, Al, Mg, Cu)

466-E. Development of Die Casting in Europe. R. Lewis Stubbs. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 225-226, 253.

Historical development and current practices in production of zinc and aluminum alloy die casting in Europe. (To be continued.) (E13; Zn, Al)

467-E. Rx. for Swollen Gray Iron Castings. J. F. Wallace and E. B. Evans. *Modern Castings,* v. 32, Sept. 1957, p. 47-49.

Review of published information on cause of expansion, influence of various mold constituents and effect on mold cavity. Equation for determining volume change. 18 ref. (E25n, P10d; CI-n)

468-E. How to Avoid Sand Segregation. *Modern Castings,* v. 32, Sept. 1957, p. 50-51, 56.

Study by joint committee of National Industrial Sand Association on occurrence and recommendations to minimize segregation. (E18)

469-E. (French.) **Some Typical Defects of Aluminum Castings and Their Causes.** R. Irmann. *Fonderie Belge,* no. 4, Apr. 1957, p. 49-53.

Effects of gas contained in original metal, of absorption of gas during melting, inclusions of air and oxide films during pouring; phenomena of solidification. (E25n; Al, 9-19)

470-E. (French.) **Melting in the Crucible.** D. W. Brown. *Fonderie Belge,* no. 4, Apr. 1957, p. 55-63.

Reviews different types of melting furnaces; construction details and uses of crucible furnaces. Problems of preheating of supercharge; analysis of metal losses based on experimental work with variety of nonferrous metals and alloys. (E10p, 1-2)

471-E. (French.) **Summary Address at Foundry Conference (June 7, 8, 9, 1956, at General Metallurgy Laboratory, University of Ghent).** A. De. Sy. *Fonderie Belge,* no. 4, Apr. 1957, p. 65-70.

Review of foundry melting processes. Cold blast cupola; characteristics and improvements; reversal of combustion gases, drying, super-oxygenization or preheating of combustive air. Silicon balance in hot blast cupola. Advantages of electric furnace melting. Melting of nonferrous metals. (E10)

472-E. (French.) **Conventional Pneumatic Molding Machines and Their Future in Mechanized Production.** R. Jacquemart. *Fonderie Belge,* no. 6, June, 1957, p. 125-131.

Types of machines, present field of use; flexibility of adaptation to various molding boxes; cost of installation (foundations, etc.), maintenance, accessories; possibilty of increasing productivity; mechanization; future of conventional machines as compared with other types of molding equipment. (E19, 1-2)

473-E. (French.) **Toward Automation in the Foundry.** W. Gesell. *Fonderie Belge,* no. 6, June 1957, p. 133-144.

Examination of possible extent of mechanization and automation in foundry operations. Description of actual mechanized installations of molding machines, melting equipment, sand apparatus. Prerequisites to introduction of automation in various departments are prior planning of automatic cycle, adaptation of equipment, production-line requirements, automatic controls. (E general, 18-24)

474-E. (French.) **Molding by the Taccone Process.** M. Lepere. *Fonderie Belge,* no. 7-8, July-Aug. 1957, p. 159-163.

Principles and advantages of Taccone process; types of patterns that can be used; characteristics of sand to be used; precautions to take in construction of mold boxes; reduction in skilled labor requirements; maintenance of Taccone machine. (E19, 1-2)

475-E. (French.) **Some Technical Aspects of Shell Molding: Possibilities of Hollow Cores.** Arthur Woods. *Fonderie Belge,* no. 7-8, July-Aug. 1957, p. 165-173, 202.

Design of pattern plates; cracking of shells; mold assembly; fabrication of cores by shell process. (E19c)

476-E. (French.) **Cement Molding.** J. Zeiser. *Fonderie Belge,* no. 7-8, July-Aug. 1957, p. 181, 201.

Principle of cement molding process; characteristics of cement and of sand-cement mixtures; process details and pointers on sand preparation, patterns, molding, blackwashing, gas released during pouring. 16 ref. (E19, E18)

477-E. (French.) **Die Casting Magnesium Alloys. Die Casting Division of Foundry Industries Technical Center.** *Fonderie,* no. 138, July 1957, p. 322-324.

Die casting of magnesium alloys is very little practiced in France because of fears aroused by difficulties involved in affinity of magnesium for oxygen. Present summary, designed to show that accidents can be avoided, outlines process, briefly describes equipment used, from crucible to machining tooling, and stresses specific safety measures. (E13, A7p; Mg)

478-E. (German.) **The Foundry Industry in Finland.** E. Autere. *Giesserei,* v. 44, Aug. 15, 1957, p. 485-490.

The metal industry; supply of metals and raw materials; pig iron, copper, coke and petroleum, electrical current, foundry sands, refractories and fluxes; the foundry industry; melting processes; description of some important foundries. (E general)

479-E. (German.) **Active Dephosphorization or Denitration of Nodular Cast Iron.** Joseph Czikel. *Giessereitechnik,* v. 3, Mar. 1957, p. 52-54.

Active dephosphorization is possible with magnesium, calcuim and cerium when conditions are such that these elements will react with the iron phosphides in the melt to form phosphides of lower solubility at given temperatures. These phosphides precipitate and can be removed from the melt by washing or by gravity separation. (E25; CI-r, *N, P*)

480-E. (German.) **Chill Casting of Nodular Iron.** Heinz Herbrich. *Giessereitechnik,* v. 3, Mar. 1957, p. 55-56.

It is shown that it is possible to chill-cast nodular iron, but since the casting cannot be worked or machined and cannot withstand dynamic stress, it has little use. However, after thermal treatment to the ferritic, ferritic-pearlitic, or pearlitic structure, the casting is usable for highly stressed machine parts. (E22r; CI-r)

481-E. (Italian.) **Use and Better Utilization of the Cupola.** Luciano Oltrasi. *Fonderia,* v. 6, June 1957, p. 247-259.

Historical summary of developments in design and characteristics of cupolas and charging methods. Combustion processes and reactions occurring in cold blast cupolas during melting. Methods of heating air for hot blast cupolas. Comparison of relative efficiency of hot and cold blast cupolas; basic process cupolas. Combination cupola-electric furnace melting systems. (E10a, 1-2; CI)

482-E. (Italian.) **Regeneration and Disintegration of Foundry Clays and Sands.** Ermes dall'Oglio and Francesco Carcano. *Fonderia,* v. 6, July 1957, p. 307-310.

Economies can be realized by suitable sand and clay recovery treatment. Methods and equipment. (E19s)

483-E. (Italian.) **Pre-Coated Sands for Shell Molding.** Rinaldo Cattaneo. *Fonderia,* v. 6, July 1957, p. 311-315.

Results of tests carried out to study influence of type of sand and particle size; how to counteract effect of solvents used in pre-coating with powdered resins; methods of pre-coating with liquid resins and mixed resins. (E19c; NM-h45)

484-E. (Japanese.) **Production of Heavy-Duty Cast Iron (Report 2). Melting of Heavy-Duty Cast Iron in Cupola.** Tadao Sato, Toshio Hirooka, Hideo Teramura, Tomohara Yoshikaur, Fumitaka Narita and Masatoshi Kikuchi. *Journal of Railway Engineering Research,* v. 14, June 15, 1957, p. 16-24.

Methods of production of heavy-duty cast iron by cupola. The following relationships were obtained: (1) temperature and coke ratio; (2) mechanical properties of the cast iron compared to oxidized cast iron. 6 ref. (E10a, Q general; CI)

485-E. (Russian.) **Use of Zirconium-Containing Sands in the Foundry.** L. Marienbakh and L. Sokolovskii. *Liteinoe Proizvodstvo,* no. 7, July 1957, p. 28-30. (CMA)

The demand for zirconium-containing sands is rapidly increasing, their principal uses being the production of refractories and forming of foundry molds. In the U.S.S.R. they are found in the Ural Mountains and in Southern European Russia. The principal zirconium minerals in the sands are zircon ($ZrSiO_4$) and baddeleyite (ZrO_2). In foundry practice the chief advantage of zirconium sands is the effective protection they afford the casting against the formation of thick crusts. 9 ref. (E18, W19g; Zr, NM-f45)

486-E. Use of Waterglass-Molding Sand Mixes Without Carbon Dioxide Hardening in Gray Iron and Steel Casting. A. Gebauer and O. Gerstmann. *Giessereitechnik,* v. 3, no. 4, 1957, p. 73-77. (*Henry Brutcher Translation* no. 4008.)

Previously abstracted from original. See item 294-E, 1957. (E18n, CI, ST, 5-10)

487-E. (Book.) **Solidification of Castings.** R. W. Ruddle. 406 p. May

1957. Institute of Metals, 17 Belgrave Square, London, S.W.1. $6.50.

Solidification mechanism and rates. Lists high-temperature thermal properties of metals and mold materials; tables of two mathematical functions used in computing heat-flow rates. 306 ref. (E25n)

488-E. (Book.) **Magnesium Casting Technology.** A. W. Brace and F. A. Allen. 171 p. 1957. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $4.95.

Magnesium casting alloys; melting practice; molding and core sands; running and gating systems for production of sand castings; production of pressure and gravity die castings; heat treatment practice; common defects of magnesium castings and inspection methods; surface treatment and application of castings. Both British and American materials and practices are considered. 154 ref. (E general; Mg)

F Primary Mechanical Working

135-F. Evaluation of Tests for Forgeability. Alan B. Draper. *ASTM Bulletin,* no. 223, July 1957, p. 62-68.

Defines components of forgeability as flow stress, ductility, external frictional resistance and range of temperatures and speeds; surveys conventional tests for evaluating forgeability including flow stress by compression, ductility by compression, friction and its determination, tension, bend, torsion tests and special forgeability tests. 35 ref. (F22, 17-2, 1-4)

136-F. Swaging. Metal Turning Supplement. *Automatic Machining,* v. 18, July 1957, p. 31-35.

Typical swaged parts illustrate advantages of hot and cold swaging for production of some pieces; work hardening effect of swaging on high-alloy and carbon steels, copper and aluminum. (F25; CN, AY, Cu, Al)

137-F. High Temperature Steel Mill Greases. John Simon. *Iron and Steel Engineer,* v. 34, June 1957, p. 93-103.

Performance requirements, properties and characteristics of high-temperature greases. Few lubricants are compounded specifically for high-temperature service. (F general; NM-h, 2-12)

138-F. Titanium—Production and Use. V. W. Whitmer. *Iron and Steel Engineer,* v. 34, July 1957, p. 130-132. (CMA)

Problems associated with the forging and rolling of titanium ingots. Turning requires surface removal up to ½ in. more, and may be supplemented by spot grinding. (F22, F23; Ti)

139-F. Cold Extrusion of Steel. Ben Kaul. *Machinery,* v. 63, Aug. 1957, p. 176-184.

Both backward and forward cold extruded techniques are illustrated by procedure in extruding a pressure tube from 1012 hot rolled steel bar; press, annealing and cleaning operations. (F24, 1-17; ST)

140-F. Theory of Rolling. Hugh Ford. *Metallurgical Reviews,* v. 2, 1957, p. 1-28.

Theory of cold rolling, starting from von Karman equation; development of theory from other assumptions and illustration of theory in relation to hot rolling. 74 ref. (F23, 1-17, 10-1)

141-F. Lubrication. A Study of Its Action in Continuous Metal Deformation Pt. 3. L . H. Butler. *Steel Processing and Conversion,* v. 43, July 1957, p. 387-395.

Determination of coefficient of friction in rolling processes and its relation to lubricant with special reference to rolling of aluminum alloys; effect of lubricant on staining of aluminum strip during annealing; pick-up of roll coating and effect on surface finish of product in hot rolling of aluminum; mechanism of action in hot rolling. 13 ref. (F23, Q9p; Al, NM-h)

142-F. (French and German.) **Problems Involved in the Manufacture of Aluminum Foil.** H. P. Grauer. *Aluminium Suisse,* v. 7, May 1957, p. 83-85.

Review of current methods of production. (F23; Al, 4-6)

143-F. Influence of Forging Temperature on Mechanical Properties of Al-V Titanium Alloys. L. S. Croan and F. J. Rizzitano. Watertown Arsenal Laboratory, Report 401/268. *U. S. Office of Technical Services,* PB 131118, Feb. 1957, 28 p. (CMA)

Mechanical property changes with forging temperature were studied for Ti-6Al-4V and Ti-7Al-4V. A production technique was developed involving press forging from above the beta transus and water quenching from the press. Toughness (impact resistance) may increase 50% without reducing strength. Improved forgeability is combined with reduced cost. (F22, 17-2; Ti)

144-F. Factors Affecting the Swelling of Steel Bars on Cold Drawing. A. I. Kukhorev. *Stal',* v. 16, no. 2, 1956, p. 181-182. (*Henry Brutcher Translation* no. 3881.)

Significance of carbon content of steel for amount of swell in cold drawn bar stock; relation between elastic strain in cold drawing and steel composition, bar diameter, amount of cold reduction and drawing speed. (F27, 1-17; ST)

145-F. Ways of Minimizing Edge Cracks in Rolling of Electrical Sheet. N. F. Dubrov. *Metallurg,* v. 1, no. 12, 1956, p. 23-24. (*Henry Brutcher Translation* no. 4019.)

Difficulties encountered in rolling of dynamo steel with increased silicon content and a 0.20-0.25% addition of aluminum to lower the watt losses. Measures adopted to minimize edge cracks; lowering the sulphur content; increasing the manganese content; lowering the ingot temperature prior to rolling. (F23, 9-22, 2-10; ST, SGA-r, 4-3)

146-F. (French.) **Straightening of Sheet, Structural Iron, Pipe and Profiles by Shrink-Heating.** André Heydacker. *Revue Generale de Mecanique,* v. 41, Feb. 1957, p. 49-52.

Straightening of metal construction elements deformed during fabrication or work handling is usually done by forging methods. It is possible to replace these conventional methods with localized heating by means of a blow torch of appropriate size. (To be continued.) (F29r)

147-F. (Polish.) **Factors Influencing the Behavior of Certain Grades of Austenitic and Ferritic Steels on Hot, Plastic Deformation.** Edward Terlecki. *Hutnik,* v. 24, June 1957, p. 222-227.

Types of cracks in high-alloy, corrosion-resistant steels; hot, plastic deformation; causes of the cracking and remedies. (F general; SS, 9-22)

148-F. (Polish.) **Internal Cracking in Ingots and Blooms on Rolling.** Jozef Gorecki. *Hutnik,* v. 24, June 1957, p. 228-234.

Causes of internal cracking of ingots and blooms on rolling; influence of the initial height, pressure and diameter of the roll; breaking strain in the area of pressure; depth of penetration of the pressure effects; prevention of internal cracking. (F23; ST, 9-22)

149-F. (Russian.) **Production of Cold Rolled Transformer Steel.** A. I. Belakov. *Metallurg,* v. 2, No. 5, May 1957, p. 22-24.

Seven steps are recommended: hot rolling, annealing, etching, first cold rolling, intermediate annealing, second cold rolling and high-temperature annealing. (F23, 1-17, J23; ST, SGA-q)

150-F. (Russian.) **Thin Sheet Rolling Mill.** A. A. Nefedov and G. Z. Shtcherbina. *Metallurg,* v. 2, June 1957, p. 23-25.

Introduction of convex rolls, strict control of heat to insure uniform temperature of the metal and gas-air ratio of 1:3.66 to 1:3.76 are factors increasing the efficiency of the mill by 40 to 70%. (F23; W23c, 1-2)

151-F. (Russian.) **Modernization of Certain Units of the Slabbing Mill.** B. M. Tsirlin. *Stal',* v. 17, Mar. 1957, p. 232-238.

Partial modernization of 1000-mm. slabbing mill equipment (roll tables, bearings, scale and scrap removal) has increased mill productivity 32% and reduced considerably idle time. Completion of the planned modernization will more than double the mill capacity in comparison with 1953. (F23n, W23a, 1-2)

152-F. (Russian.) **Multiple Cold Drawing of Tubes With Application of Phosphatizing Bath.** M. S. Goncharevsky, F. A. Danilov, S. S. Shaikevich and P. K. Stasevich. *Stal',* v. 17, Mar. 1957, p. 243-253.

The multiple cold drawing of tubes with the phosphate bath has a number of technical and economic advantages, improving the deformation process, raising productivity of the equipment, and saving fuel, metal and tools. 12 ref. (F26r, 1-17; NM-h)

153-F. (Russian.) **A Rail Ingot of 9.75 Tons.** M. T. Bulsky, F. F. Sviridenko, A. G. Alimov and O. V. Dolinenko. *Stal',* v. 17, Apr. 1957, p. 305-310.

The history of one of the largest rail steel ingots from the Azovsteel blooming mills is given. Satisfaction is expressed with the quality of the metal of finished product and mechanical properties. (F23; ST, 5-9)

154-F. (Russian.) **Economic Use of the 450 Mm. Strip Rolling Mill for Producing Plowshares.** L. N. Soroko and M. L. Mirenskii. *Stal',* v. 17, Apr. 1957, p. 329-332.

Possibility of using automatic machines in treatment of strip steel. The practice at the Kuznetsk Metallurgical Combine in producing a profile for 149D plows. (F23, G general; ST, 4-3)

155-F. (Russian.) **Consideration of Mechanical Marking of Blooms and Slabs.** I. S. Pobedin and I. F. Prikhodko. *Stal',* v. 17, Apr. 1957, p. 333-340.

Mechanism for making billets after the pass through the cogging mill, located on the roll table beyond the shears. The billets are stamped without stopping the metal; a device mechanically changes the stamp. (F29, X6p, 1-2)

156-F. (Russian.) **Technique for Rolling Tubes From Ingots.** V. V. Shveikin and L. N. Karpenko. *Stal',* v. 17, Apr. 1957, p. 340-342.

At the Cheliabinsk Tube Plant improvement in rolling tubes was achieved by using polyhedral ingots in place of round ones, by use of a new double-bevel grooving of the piercing mill rolls and employment of a new mandrel. (F26s; ST)

157-F. (Russian.) **Area Reduction Coefficient of Forgings of Disk-Shape.** I. G. Generson. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 49-55.

The value of height reduction coefficient is well established, being about 2-3. The same value for area reduction is less well established but is usually 2.5 to 3. The results of eight experiments are summarized and photographs of microstructure reproduced. (F22, 17-2)

158-F. (Russian.) **Speed of Deformation on Forging and Hot Stamping.** D. I. Berezovski. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 63-66.

Speed of deformation of ingots or billets on forging is responsible for discrepancies between computed and actual values for specific pressure and force of the hammer or the press. Formula for speed of deformation on forging, stamping and drawing in relation to the force and specific pressure. Formulas for the speed of deformation of the billets on hydraulic, steam-hydraulic forging and stamping, pneumatic and steam-pneumatic hammering and hot stamping. 9 ref. (F22, 3-17)

159-F. Seamless Tube Giant Producing at Sault Ste. Marie. *Canadian Metalworking,* v. 20, July 1957, p. 46-49.

Forming of seamless steel tubing from 4½ to 10¾ in. o.d. in new Canadian mill. (F26, 1-2; ST)

160-F. Pipe Manufacture and Use. P. D. Thomas. *Iron and Steel Engineer,* v. 34, July 1957, p. 84-87.

Butt welding, lap welding, rotary piercing, electric welding, gas welding and extrusion methods applied to meet demand for oil, gas, water, construction and mechanical uses for tubes and pipes of carbon, alloy and stainless steel, aluminum, copper, titanium and other nonferrous metals. (F26, T26r, 17-7; CN, AY, SS, Al, Cu, Ti)

161-F. Cold Extrusion of Steel on Verson Presses. *Machinery,* v. 91, July 12, 1957, p. 90-94.

Advantages of components produced by cold extrusion of steel illustrated by numerous extruded parts. (F24, 1-17; ST)

162-F. Developments in Aluminium Extrusion Techniques. *Machinery,* v. 91, Aug. 9, 1957, p. 309-313.

Facilities and techniques at Halethorpe plant for casting aluminum ingots, cutting into billets, billet heating and extrusion of variety of shapes in lengths up to 100 ft. Production of hollow extrusions and other special shapes; heat treatment and inspection. (F24; Al)

163-F. How Rolled Magnesium Sheet and Plate Is Produced. *Magnesium,* Aug. 1957, p. 10-15.

Procedure in melting, fluxing, alloying, casting slabs and ingots, nature of deformation during rolling, hot rolling operations; arrangement of roll and roll material; lubricant heating methods; types of rolling mills, annealing, cold rolling, roller levelling; thermal flattening. (F23, C5; Mg, 4-3)

164-F. Electrical Equipment for a Cold Cut-Up Line. *Metallurgia,* v. 56, Aug. 1957, p. 57-60.

Cut-up line now in commission at the Abbey works of the Steel Co. of Wales is designed to cut strip from 15-ton coils into lengths ranging from 4 to 36 ft., and to flatten and pile the cut lengths. Both automatic and manual control is possible and the maximum speed of operation when cutting ⅜-in. steel is 150 ft. per min., rising to 250 ft. per min. for 3/16-in. steel. (F29q; ST, 4-3)

165-F. When to Use Cold Extrusion for Steel Parts. Charles B. Grace. *Product Engineering,* v. 28, p. 145-147.

Description of process and use in designing shafts, cylinders and other parts of similar shape. (F24, T7; ST)

166-F. Steel and Titanium Extrusions. F. T. Roberts, Jr. *SAE Journal,* v. 65, June 1957, p. 75-77.

Applications in aircraft; advancements and future possibilities. (F24, 17-7; ST, Ti)

167-F. (French.) **Contribution to the Study of Rolling Equipment. Sect. C. Malleability and Flow of Metal During Hot Rolling.** (Continued.) G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3504, May 1957, p. 275-281.

Blooming of ingots; rolling of plate from blooms, of angle-iron, girders, U-iron, rail steel; types of rolls and method of handling required to obtain desired shapes; accessories. (To be continued.) (F23, 1-16, W23a, W23b, W23c, 1-2)

168-F. (German.) **Flow Separation Angle and Relative Velocity During Rolling and Flattening.** Zygmunt Wusatowski and Zbigniew Szalajda. *Neue Hütte,* v. 2, June 1957, p. 367-375.

Measuring instruments designed for the tests; calcuation of the circumferential velocity of the rolls and of the velocity of rolled products based on oscillograph recordings; relative velocity determination by means of notches. 10 ref. (F23, S18n)

169-F. (Italian.) **Stamping of Metals by Means of Hot Plastic Deformation. Pt. 4. Preparation of Forging Stock.** *Rivista di Meccanica,* Mar. 1957, p. 35-37.

Types of stock used; dimensional tolerances of rolled and drawn ferrous bar stock; heat treat condition of stock. (To be continued.) (F22)

170-F. (Russian.) **Temperature Distribution of Ingot Heating in Regenerative Soaking Pits.** E. I. Kazantsev and M. N. Strelets. *Stal',* v. 17, Apr. 1957, p. 358-361.

Experimental investigation of the quality of ingot heating in regenerative soaking pits; variations of asymmetrical ingot heating as a function of time; conditions for preventing the flashing off of the mild rimmed steel ingots. (F21b; ST-d, 5-9)

G Secondary Mechanical Working

Forming and Machining

316-G. Stainless Steel Pt. 3. Reaming and Tapping. J. A. Ferree. *Automatic Machining,* v. 18, July 1957, p. 42-48.

Speeds, feeds, tools, equipment and lubricant in reaming and tapping of free-machining grades, straight chromium grades and chromium-nickel grades of stainless steels. (G17e, G17f; SS)

317-G. Stainless Steel. Pt. 4. Threading. J. A. Ferree. *Automatic Machining,* v. 18, Aug. 1957, p. 39-42.

Tooling, die design and material, hardness of stock, speed, roughing and finishing procedures for various stainless steel grades. (G17f; SS)

318-G. Shortcut to Long Runs: Heavy Duty Steel Rule Dies. E. K. Scott. *Iron Age,* v. 180, July 4, 1957, p. 80-81.

Note on use of steel rule blanking dies for stamping variety of steel, aluminum, copper or brass sheet parts; die life. (G3, W24n, 1-2; Al, Cu, ST)

319-G. Designing for Chemical Milling. R. W. Beckim. *Machine Design,* June 13, 1957, p. 153-156.

List of conditions where chemical milling is advantageous and some design suggestions. (G17b)

320-G. Machining Heat-Resistant Alloys. R. D. Halverstadt. *Machine Design,* June 13, 1957, p. 163-168.

Machinability follows the general order of high-temperature strengths with some notable exceptions. Relationship between design, machining and milling problems. (G17k, SGA-h)

321-G. Sub-Zero Machining and Quenching. R. J. Delaney. *Machinery,* v. 63, July 1957, p. 148-153.

Variations of subzero treatment followed by Douglas Aircraft: dip process after heat treatment; supplying subzero coolant during machining; subzero and boiling water treatment. (G17, 2-13, J26)

322-G. Integrally Stiffened Wing Panels Formed by Shot-Peening Kenneth Sparling. *Machinery,* v. 63, July 1957, p. 170-173.

Advantages of shot peen forming over hot bending methods. Curvature is controlled by altering peening intensity and degree of saturation. (G23n)

323-G. Splines Formed Ten Times Faster by Cold-Rolling. Miles Etzel and C. E. Kopp. *Machinery,* v. 63, Aug. 1957, p. 165-167.

Cold rolling of splines in hardened and ground AISI type-410 stainless steel. (G11, 1-17; SS)

324-G. Spinning Broadens Uses of Titanium. *Modern Industrial Press,* v. 19, Mar. 1957, p. 37. (CMA)

Lukens Steel Co. has successfully formed a "head" of solid titanium with spinning equipment. The successful use of spinning equipment opens the possibility of fabricating larger titanium components at lower cost. Rem-Cru A-55 plate was spun at 600° F., using a plate previously heated to 1400-1450° F. (G13; Ti)

325-G. Machining Stainless Steel. G. J. Stevens. *Modern Machine Shop,* v. 30, July 1957, p. 142.

Single chip-breaker groove on one lip of drill increased tool life in drilling hardened stainless shafts. (G17e; SS)

326-G. Coated Abrasives in Metal Finishing. J. Zoethout. *Product Finishing,* v. 10, July 1957, p. 53-58, 120.

Advantages of grinding with abrasive belts for both ferrous and nonferrous industry; applications such as grinding, fininshing and polishing castings; weld removal, centerless grinding, backstand polishing, grinding of automobile bumpers, wrenches, pliers, tableware. (G18, 1-2; NM-j)

327-G. Chemical Milling and Contour Machining in Aircraft Production. Andrew L. Forrester. *Sheet Metal Industries,* v. 34, May 1957, p. 336-340, 352.

Chemical milling of aluminum alloys as practiced by American aircraft industry. Contour milling machines of titanium and aluminum. (G24b, G19; Al, Ti)

328-G. Manufacture of Deep-Drawn Aluminium Containers. F. H. Barker. *Sheet Metal Industries,* v. 34, June 1957, p. 449-454.

Operations and equipment in forming and deep drawing aluminum food containers. (G4b; Al)

329-G. Manufacture of 40-Gallon Oil Drums. A. K. McLeod. *Sheet Metal Industries,* v. 34, July 1957, p. 495-501.

Trimming, bending, spot and seam welding, flanging, corrugating, end forming, testing machines and operations in production of steel drum. (G general, K3n, K3p; ST)

330-G. Rolls Forge Precision Parts. *Steel,* v. 141, July 8, 1957, p. 97-100.

Products from grade rolling include cutlery, springs, automobile axle shafts; other contour rolling mills have been used to roll forged stainless and titanium compressor blades. (G11)

331-G. Complex Shapes at Bargain Rates. *Steel,* v. 141, Aug. 12, 1957, p. 124-126.

Hydroforming process with flexible diaphragm, in place of conventional female die, forms variety of ferrous and nonferrous parts with minimum tooling costs. (G14b)

332-G. Production Drilling and Reaming of Precision Holes. Herbert Gregg. *Tooling and Production,* v. 23, July 1957, p. 71-74.

Results of production runs on stainless steel and cast iron parts using trepanning-type drills and high-pressure coolant fed through the tool. (G17e; SS, CI)

333-G. Choose With Care Your Press Drawing Lubricants. Leon Salz. *Tooling and Production,* v. 23, July 1957, p. 87-91.

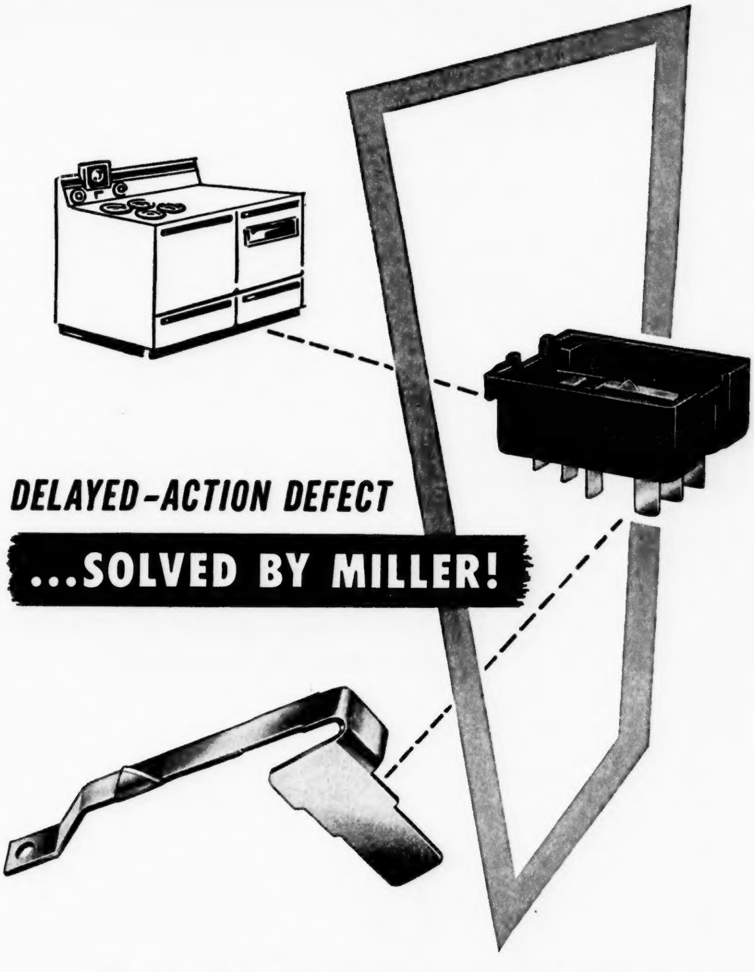
Classification, description, industrial requirements and recommendations. (G1; NM-h)

334-G. Applications of Chem-Mill to Airframe Structures. L. G. Hall. *Tooling and Production,* v. 23, Aug. 1957, p. 98-100.

Process has limitations, but has a wide range of adaptability. Aluminum, titanium, magnesium and many alloy steels may be etched. (G24b; Al, Mg, AY)

335-G. (Russian.) **Wear of Ceramic Tips on Fine Machining of Cast Iron.** V. A. Kacher. *Stanki i Instrument,* v. 28, Apr. 1957, p. 25-28.

Tip wear as a function of speed and depth of cutting presented graphically. Ceramic tips perform much better on cast iron than tips made of high-grade toolsteel. (G17, Q9n; CI, 6-20)



336-G. Preparation of Microsections of Cemented Carbides Without Diamond Wheels. I. K. Trushin. *Zavodskaya Laboratoriya,* v. 22, no. 7, 1956, p. 810-811. (*Henry Brutcher Translation* no. 4012.)

Previously abstracted from original. See item 355-G, 1956. (G17; SGA-j)

337-G. Depth of Strain-Hardened Layer Produced by Shot Peening. N. A. Petrova and M. Ya. Shashin. *Vestnik Mashinostroeniya,* v. 36, no. 11, 1956, p. 47-50. (*Henry Brutcher Translation* no. 4024.)

New, universally applicable (routine) method of testing the quality of shot peening and the depth of the compressed layer, based on the change in the electrical and magnetic properties of metals owing to plastic deformation of their surface. Agreement between results of proposed method and those of microhardness measurements and X-ray analysis. Correlation between depth of compressed layer on various steels and diameter of parts shot peened. (G23n, 1-4)

338-G. (French.) **A New Energy Diagram of the Formation of a Metal Chip.** Felix Eugene. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 853-856.

Curves as determined by test cuts with high speed steel tools on tempered steel. (G17k; ST)

339-G. (French.) **A Metallographic Study of Chip Formation.** Michel Weisz. *Institut de Recherches de la Siderurgie, Publication,* Ser. A, no. 142, Feb. 1957, 204 p.

Mechanical tests and metallographic techniques were used to study mechanism of deformation and preferred orientation of chip. Comparison of state of consolidation of chip produced by machining and state induced by tensile stress, plastic deformation, pure torsion, torsion plus compression, in conventional tests. Formation and stability of built-up edge during machining of killed mild steel, light alloys, stainless steel. Influence of sulphur on machinability. 43 ref. (G17k, M27)

340-G. (German.) **Hot Cold Drawing.** H. Cross. *Fertigungstechnik,* v. 7, Jan. 1957, p. 1-6.

Drawing with increased temperature in the upsetting zone (Stauchzone); a water-cooled drawing ring and drawing punch result in lower deformation resistance and greater tensile strength in the water-cooled areas. This method permits a drawing ratio of 0.23 with light metals and 0.30 with steel sheet. 6 ref. (G4, Al, ST)

341-G. (German.) **Use of the Hydraulic Press in the Stretch-Forming of Automobile Bodies.** W. Salzer. *Fertigungstechnik,* v. 7, Jan. 1957, p. 6-7.

Use of wooden dies clad with sheet metal for smaller amounts of light metal, and cast iron dies for larger amounts in stretch-forming of body parts. (G9, 1-2, T21a)

342-G. (German.) **Grinding in Foundries with Heavy Grinding Machines.** Bernhard Dahlem. *Giesserei,* v. 44, July 4, 1957, p. 411-413.

Peripheral speed; grinding efficiency and diameter of the grinding wheel; efficiency and cost of abrasives; safety of operation. (G18)

343-G. (German.) **How to Apply the Blast Lapping Method.** E. Klüppelberg. *Werkstatt und Betrieb,* v. 90, July 1957, p. 441-443.

Methods of blast lapping; present applications; lapping of workpieces, improvement of surface finish, deburring and the pretreatment of surfaces. 5 ref. (G19p)

344-G. (Italian.) **Experimental Research on "Hindered" Chip Formation During Orthogonal Turning.** Giulio Fornasini. *Ingegnere,* v. 31, Apr. 1957, p. 301-309.

Examination of theories intended to solve the problem of machinability of metals through study of chip formation during free orthogonal turning. Explanation of "hindered" turning as that which occurs when tool with two cutting edges removes stock simultaneously, under given setting conditions, the formation of chip no longer being "free" because the portions of removed metal get in each other's way. Experimental machining of cylindrical piece of case-hardened alloy steel, 80φ x 600 mm., with tungsten carbide-tipped tool, provided basis for determining limits of validity of theories on "free" turning when applied to "hindered" turning. 9 ref. (G17k)

345-G. (Polish.) **Drawing Force for Solid, Round Profiles.** J. Bazan. *Hutnik,* v. 24, May 1957, p. 186-192.

A new formula is proposed, based on the theory of plastic deformation. A formula is also presented for ideal drawing conditions. Values computed according to the formulas are compared with experimental results. 5 ref. (G4, Q24)

346-G. (Russian.) **Heat Balance in Titanium BT2 Alloy Cutting.** A. M. Danelan. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 39-43.

A method of heat measurement is described. The relationship of the alloy and shavings temperature to speed of cutting is established. Proportion of the heat contained in the shavings increases with the speed of cutting. In comparison with the steel, the temperature of the alloy is twice as high at the same speed of cutting and the temperature of the cutting tool 3 or 4 times as high. To overcome the conditions a lubricant possessing good cooling properties is recommended. (G17, P11k; Ti)

347-G. (Russian.) **Thermal Deformation of Tools on Cutting Cast Iron.** V. I. Ishutkin.*Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 44-46.

The relationship of thermal elongation of the cutting tool and the speed and depth of cutting as well as hardness of the cast iron is presented graphically. The elongation increases 80-95 meters per min. Formula for computation of thermal deformation tool. (G17, P10d; CI)

348-G. Russians' "Punch-Less" Drawing Requires Fewer Operations. N. A. Maslennikov. *American Machinist,* v. 101, July 1, 1957, p. 81-84. (From *Vestnik Mashinostroeniia,* v. 36, 5, p. 59-63.)

Previously abstracted from original. See item 341-G, 1956. (G4, Al)

349-G. Two-Way Squeeze Makes Precise Aircraft Members. *American Machinist,* v. 101, July 1, 1957, p. 88-89.

Aluminum alloy channels and curved, flanged bulkheads preformed in conventional rubber forming press, then compression formed in die with rubber die insert giving close tolerances to flange angle and mold life. (G14a, T24a, 17-7; Al)

350-G. How to Abrasive Finish Cast Iron. Charles F. Walton. *Machinist,* v. 101, July 1, 1957, p. 93-96.

Surface, cylindrical, centerless and internal grinding methods; types of abrasive wheel, grit size and speeds for grinding cast iron. (G18, 1-2; CI)

351-G. Five Good Reasons for Abrasive-Belt Grinding. Alan G. Diamond. *American Machinist,* v. 101, Aug. 26, 1957, p. 106-107.

Advantages of using abrasive belt for grinding rib projections in stainless steel, ring assembly of jet engine. (G18k; SS)

352-G. Cutting Speeds for Oxide Tools. *American Machinist,* v. 101, July 1, 1957, p. 115.

Chart showing relationship between Brinell hardness of work and appropriate cutting speed for ceramic tools. (G17; Q29a; SGA-j, 6-20)

353-G. Fundamentals of Ultrasonic Machining. Patrick J. Duran. *American Machinist,* v. 101, Aug. 26, 1957, p. 114-116.

Ultrasonic machining depends on transducer for converting electrical energy into mechanical vibration and vibrating tool with small amounts of abrasives for cutting through such materials as tungsten carbides and hardened toolsteel. (G24c)

354-G. Machining MST 6Al-4V Titanium. N. Zlatin, et al. *American Machinist,* v. 101, Aug. 26, 1957, p. 135, 137, 139. (CMA)

High-speed steel tools are recommended for turning, milling, drilling, tapping and band sawing Ti-6Al-4V. Carbide tools are suitable for turning and milling. Tool geometries are recommended for both tool materials. Results of machining tests are tabulated for Ti-6Al-4V bar and sheet in various conditions of heat treatment. (G17; Ti)

355-G. Surface Grinding. Horizontal Spindle-Reciprocating Table. Pt. 2. *Grinding and Finishing,* v. 2, Apr. 1957, p. 37-42.

Fundamentals applying to production operations; maintenance of grinding machines, grinding stress and coolants. (G18k, 1-2)

356-G. Jet Blade Finishing. J. Karl McLaughlin. *Grinding and Finishing,* v. 2, Apr. 1957, p. 48-53.

Specialized techniques for production finishing of jet blades, stator blades, jet buckets and nozzle diaphragms. (G18; T7h)

357-G. Surface Grinding. Pt. 4: Wheel Selection, Forming, Dressing. *Grinding and Finishing,* June 1957, p. 45-51.

Factors influencing selection; wheel preparation and forming methods. (To be continued.) (G18k, 1-2)

358-G. Trepanning: Faster Holes With Fewer Chips. E. J. Egan, Jr. *Iron Age,* v. 180, Aug. 15, 1957, p. 91-93.

Advantages of trepanning for boring long holes through variety of alloy steels. (G17d; AY)

359-G. Lead in Cast Steel: How Much Does Machinability Improve? W. J. Phillips and D. B. Barron. *Iron Age,* v. 180, Aug. 15, 1957, p. 102-103.

Steel castings containing from 0.12 to 0.20% lead have higher machinability ratings and give improved finish compared to similar nonleaded steels. (G17k, 2-10; ST, *Pb,* 5-10)

360-G. Add Copper to Make Steel Bars More Machinable. *Iron Age,* v. 180, Aug. 22, 1957, p. 112-114.

Controlled amounts of copper in C1144 cold drawn steel improve machinability, wear properties and corrosion resistance. Mechanical properties are not adversely affected. (G17k, Q9n, R general, 2-10; ST, *Cu*)

361-G. New Performing Method Cuts Light Metal Stamping Costs. John Straw. *Light Metal Age,* v. 15, Aug. 1957, p. 12-14.

"Prestressing" sheet metal blank allows subsequent hammer forming with minimum tooling. New (Engel) process uses an elastomeric pattern and impression to determine the areas and volume of materials to be displaced for easy forming, and to incorporate appropriate deformation details in inexpensive set of preforming dies. (G3; Al, Mg)

362-G. High Tensile Materials Call for New Machining Methods. John A. Zura. *Machine and Tool Blue Book,* v. 52, Sept. 1957, p. 140-147.

Tips on choosing carbide grades and tool geometry for machining materials of 180,000 to 320,000 psi. (G17; SGA-j, SGB-a)

363-G. Roller-Burnishing With Hegenscheidt Equipment. *Machinery,* v. 91, June 21, 1957, p. 1385-1389.

Roll burnishing technique for cold rolling surface of previously machined components; the rolling operation and machine. (G23s, 1-2)

364-G. Developments in Methods for Processing Titanium. *Machinery (London),* v. 91, Aug. 9, 1957, p. 291, 341. (CMA)

A cheap method of heating the blocks used in stretch-forming is based on separate heating units which may be attached to various blocks. Higher temperatures and uniform heating are needed in drop hammer forming, but the electrical resistance of titanium is helpful. Hollow inlet guide vanes for gas turbines are produced by wrapping titanium around a forming tongue, and aerofoil forms on compressor blades are produced in finished form by a roll-forming process. (G general; Ti)

365-G. Skin Milling at 100 In. per Min. Harold Young. *Machinery,* v. 64, Sept. 1957, p. 167-169.

Gantry-type skin mill at Avro Aircraft speeds output of integrally stiffened skins and completely machined structural members. Skins are machined from solid billets of 75S-T6 aluminum alloy. (G17b, 1-2; Al)

366-G. The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging,* v. 24, July 1957, p. 263-271.

Discusses ambiguity of the term "machinability"; surveys elements of variables used in evaluating machinability and considers individual empirical methods for machining evaluation covering tool force, power consumption and other variables. 42 ref. (G17k)

367-G. Metalworking by Spark-Erosion. Pt. 2. W. Ullman. *Metalworking Production,* v. 101, June 28, 1957, p. 1117-1121.

Advantages and numerous examples of spark-erosion machining for production of dies of tungsten carbide, stellite, stainless steel and alloy steels. (G24a, W24n, 17-7; SS, AY, SGA-m, 6-19)

368-G. Tough Approach to Stainless. A. Quinlan. *Metalworking Production,* v. 101, July 19, 1957, p. 1243-1244.

Speeds of 500 to 1000 surface ft. per min. used for more efficient turning of Types 410 and 321 stainless steels. (G17a; SS)

369-G. How to Machine Cast Iron. Pt. 2. General Machining Recommendations. Norman Zlatin, W. H. Friedlander and Charles F. Walton. *Metalworking Production,* v. 101, July 19, 1957, p. 1245-1249.

Recommends speed, feed, tool material, tool angles, lubricants for turning, milling, drilling, tapping and reaming operations on gray iron. (G17; GI-n)

370-G. Progress Report on Ceramics. Pt. 8. How Should You Use Ceramics. Robert T. Hook. *Metalworking Production,* v. 101, July 26, 1957, p. 1294-1296.

Summary of experiences in machining SAE 4150 hot rolled annealed steel, C-1045 hot rolled annealed steel and AISI C-1015 cold rolled steel with ceramic tools. (G17; CN, SGA-m, 6-20)

371-G. Control of Quality in Automation. Pt. 2. John Loxham. *Metalworking Production,* v. 101, Aug. 2, 1957, p. 1319-1325.

Recently developed automatic controlling equipment for control of grinding operations; gaging and controlling arrangements for centerless, internal, cylindrical and other grinding methods. (G18, 18-24)

372-G. Compression Forming Sets Precise Shapes. *Metalworking Production,* v. 101, Aug. 9, 1957, p. 1384-1385.

Compression forming of high-strength aluminum alloys in a die following forming in a conventional rubber forming press, holds flange angle and mold line to close tolerances. (G14a; Al)

373-G. Progress Report on Ceramics. Pt. 9. Ceramic Tools Pay on Short Runs, Too. George H. De Groat. *Metalworking Production,* v. 101, Aug. 9, 1957, p. 1386-1387.

Experience at North American Aviation indicates ceramic tools may be used with advantage in production turning of SAE 4130 and SAE 4140 because of increased tool life compared to carbide tools. (G17a; AY, SGA-m, 6-20)

374-G. How to Deep Draw Titanium Alloys. E. A. Farrell. *Modern Metals,* v. 13, Aug. 1957, p. 60, 62, 64, 66. (CMA)

Advantages of stamping over other fabrication methods for titanium are speed, low cost, close tolerance and strength. Alloys studied were C-110M, A-110AT, Ti-6Al-4V and RS-110-BX. They have good properties for industrial stamping. (G4b; Ti)

375-G. Planisher Shaves Weld Costs. *Steel,* v. 141, Aug. 19, 1957, p. 150-151.

Roll planishing of welds in aluminum, titanium, stainless or alloy steel sheets improved physical properties of joint. (G23s; Al, Ti, SS, AY, 7-1)

376-G. (French.) Machining of Copper and Copper Alloys. Pt. 5. Piercing, Milling, Drilling, Threading and Tapping. *Cuivre Laitons Alliages,* v. 32, July-Aug. 1957, p. 7-17.

Factors involved in drilling; threading tools; tapping speeds. Types of alloys are specified in each case. (To be continued.) (G17; Cu)

377-G. (French.) Spark Machining and Tooling Problems. M. Monfils. *Machine Moderne,* v. 51, July 1957, p. 13-16.

Spark machining enabled shop specializing in wire and tube drawing of nonferrous alloys to do difficult machining and retouching jobs on carbide dies and tooling made of alloy steels, stellite type and other cobalt or chromium-base alloys—work previously done by suppliers. Results were savings in money, time and labor, increased production flexibility, reduction in tooling stock carried. Polishing of carbide dies was eliminated. (G24a; SGA-j)

378-G. (French.) Spark Machining of Items Used in Experimental Work and Research. M. Grauleau. *Machine Moderne,* v. 51, July 1, 1957, p. 17-18.

Spark machining has resulted in greater precision, better finish, fewer rejects, time savings, in turning out parts made of nickel, copper and other soft metals. (G24a; Ni, Cu)

379-G. (French.) Mechanics of Metal Cutting. Roger Jouty. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 326, 1957, 98 p.

Shear deformation and friction phenomena; review of theories of Piispanen and Merchant; measuring techniques used in this study, and experimental results; interpretation of results obtained on steel; quantity of heat released during cutting; rise in temperature of tool and chip; use of carbide tools and experimental results; tool vibration. 43 ref. (G17)

380-G. (German and French.) Flame Cutting Equipment. H. P. Siegenthaler. *Zeitschrift für Schweisstechnik,* v. 47, Aug. 1957, p. 201-206.

Types of equipment and operating procedures. (G22g, 1-2)

H Powder Metallurgy

66-H. Why Cemented Carbides Behave as They Do. E. H. Despard. *Canadian Machinery,* v. 68, June 1957, p. 134-136, 246, 248.

Preparation, properties, compressive, tensile and transverse rupture strengths, wear, corrosion and shock resistance, porosity, chemical composition. (H general, Q general; 6-19)

67-H. Could Powder Metallurgy Benefit You? George G. Karian. *Design Engineer,* June 1957, p. 53-57.

Five classes of powder parts now being commercially produced with brief descriptions of fabrication. Limitations, design and requirements of punches and dies. (H general, 17-7; 6-22)

68-H. Furnace Sintering of Metals and Ceramics. R. L. Harper. *Metal Progress,* v. 72, Aug. 1957, p. 69-72.

Brief notes on temperatures, times and atmospheres for the well-known powders, plus remarks on reasons for vacuum sintering, the handling of mixtures for magnets and electronic "ferrites", as well as the metallizing of ceramic bodies so connections can be welded or soldered thereto. (H15, W26e, 1-2)

69-H. (Japanese.) Formation of Titanium Carbide. Masanao Nakagawa. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, Apr. 1957, p. 379-383. (CMA)

The reaction processes used in forming TiC were investigated by measuring volume decreases due to heating and the amounts of carbon in the carbide formed by sintering. Also studied were the equilibrium structures of the sintered mixtures at 1600 and 1800° C. 13 ref. (H general; Ti, 6-19)

70-H. (German.) **Conception of "Grinding Equilibrium" as Used in Powder Metallurgy.** Gustav F. Hüttig. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 352-356.

Concept of grinding equilibrium derived for milling arrangement independently of the intitial particle size. Predictions are tested on oil-water emulsions, copper powder and glass powders. 38 ref. (H10e)

71-H. Preparation of Metal Powders by Sodium Reduction. T. P. Whaley. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 129-137.

Finely divided iron, nickel, cobalt, manganese, cadmium, zinc, tin silver and copper were prepared by reaction of sodium dispersions with hydrocarbon suspensions or either solutions of their metal halides. The metal powders were separated from the by-product sodium chloride by leaching with deaerated water and drying the products under vacuum. 13 ref. (H10c; Fe, Ni, Co, Mn, Cd, Zn, Sn, Ag, Cu, *Na*)

72-H. Design for Metal-Powder Parts. Robert Talmage and John Kolb. *Product Engineering,* v. 28, p. 183-190.

Design suggestions for some basic shapes, economics, tooling problems and opportunities. 5 ref. (H general, 17-1)

73-H. (Swedish.) **Production of Rolled Steel Directly From Pig Iron Powder.** *Jernkontorets Annaler,* v. 141, no. 6, 1957, p. 317-331.

A new process of producing rolled steel directly from granulated pig iron is described, where pig iron powder is mixed with about 15% of pure iron ore concentrates. The mixture is packed in a box of thin sheet and decarburized at 1100° C. and directly rolled to solid steel in the same heat. During the rolling operation the powder and the sheet cover are completely welded together. 11 ref. (H14j; Fe, ST)

J Heat Treatment

204-J. Nondestructive Determination and Control of Shallow Carburized Case Depths. Romeo Suffredini. *ASTM Bulletin,* no. 223, July 1957, p. 74-78.

Data on correlation of liquid-carburized case depth in AISI C1010, B1112 and C1120 steels with Rockwell superficial hardness values. (J28, Q29a; CN)

205-J. Determination of Hardening Properties in Unalloyed and Lightly Alloyed Steels. Erich Greulich. *Draht (English Edition),* no. 28, Apr. 1957, p. 11-14.

Number representing natural logarithm of shortest half-time period of isothermal, austenitic, conversion phase used to determine hardening properties of carbon and low-alloy steels; advantages of method compared to face quenching test. (J5, 1-4; CN, AY)

206-J. Prepared Furnace Atmospheres for Heat Treating. E. J. Funk, Jr. *Industrial Gas,* June 1957, p. 14, 20.

Types of atmospheres commercially available and typical applications. (J2k; RM-g)

207-J. Metallurgical Aspects of Induction Heating. Pt. 2. Harry B. Osborn, Jr. *Industrial Heating,* v. 24, July 1957, p. 1350-1362.

Description and illustrations of relationship in controllable variables such as frequency, depth of hardness, power density and structure. (J2g)

208-J. Metallurgical Aspects in the Design and Operation of a Continuous Annealing Line. Pt. 3. A. F. Mohri. *Industrial Heating,* v. 24, July 1957, p. 1370-1378.

Influence of composition on hardness. Equation representing combined effect of Rockwell hardness value, effective soak time, maximum soaking temperature, effective cooling time, carbon content and phosphorus content. 7 ref. (J23, 1-11)

209-J. Strengthen Powdered Iron Parts With Steam. F. L. Spangler and M. E. Lackey. *Iron Age,* v. 180, Aug. 1, 1957, p. 98-99.

Heat treating parts in a superheated steam atmosphere increases hardness and compressive strength. Wear and corrosion resistance are also increased. (J general; Fe, 6-22)

210-J. Position of the Cold Shortness Threshold in Temper Embrittlement. V. I. Prosvirin and E. I. Kvashnina. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1955, p. 17-20. (*Henry Brutcher Translation* no. 3911.)

Previously abstracted from original. See item 45J, 1956. (J23, Q26s; AY)

211-J. Sintin, a New and Efficient Agent for Gas Carburizing. A. T. Kalinin, M. N. Kunyavskii and A. Ya. Zaitseva. *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1956, p. 40-49. (*Henry Brutcher Translation* no. 3975.)

Shortcomings of the customary gas carburizing agents; relationship between amount of soot and coke formed in furnace and the carburizing time. Tests for susceptibility of the various agents to sooting and coking; suitability of paraffins compared to olefins, naphthenes and aromatics as constituents of gas carburizers; their relative efficiencies; advantages of use of various fractions of Sintin, a low aromatic, high paraffin Fischer-Tropsch oil free from sulphur. (J26g; ST, RM-g)

212-J. (French.) **Selection and Heat Treatment of Gear Steels.** (Concluded.) O. Pattermann. *Métallurgie et la Construction Mécanique,* v. 89, July 1957, p. 643-652.

Tempering after case hardening; annealing; examples of heat treatment of gears as practiced in the United States. 44 ref. (J general, T7a; ST)

213-J. Surface Hardening of Titanium With Metalloid Elements. A. Siede and V. Pulsifier. Watertown Arsenal Laboratory, Report 401/84-55. *U. S. Office of Technical Services,* PB 131103, May 1955, 99 p. (CMA)

Titanium with nitrided surfaces has great wear resistance and hardness, but case depth is too small for many uses. Case depth is increased when oxygen is used with nitrogen, but the brittleness of the case is also increased. The processes described provide hard, wear resistant and antigalling surfaces to titanium and its alloys. (J28k; Ti)

214-J. (French.) **Case Hardening. Hardening of Steels After Case Hardening.** G. de Smet. *Pratique des Industries Mechaniques,* v. 43, Apr. 1957, p. 91-96.

Structure of steel immediately after case hardening treatment; cooling after case hardening; homogenization; regeneration; quenching, direct, single, double; treatment of case hardening alloy steels; tempering of quenched case hardening steels. (To be continued.) (J28, J29; ST)

215-J. (French.) **Case Hardening by Oxy-Acetylene Torch.** Marcel Vilez. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 67-77.

Techniques, variable, types of steel and cast iron to which this treatment can be applied, equipment and characteristics imparted. (J2h, 1-2; ST, CI)

216-J. (German.) **Investigation Into the Normalizing Heat Treatment of Constructional Steels by Single or Repeated Impulse Heating.** K. Wellinger and P. Rupp. *Schweissen und Schneiden,* v. 9, July 1957, p. 339-349.

Normalizing in the welding machine; selection of suitable conditions; effect of repeated heating; comparison of results. 11 ref. (J24, K general; ST, SGB-s)

217-J. (Japanese.) **Gas Annealing of Blackheart Malleable Cast Iron.** *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 217-218.

Effect of varying carbon monoxide and carbon dioxide ratio in the annealing furnace. (J23b, W27g, 1-2; CI-s)

218-J. (Russian.) **On Minimizing Brittleness of Nitrided Layer of 38XMYA Steel.** A. A. Yurgenson and T. M. Pogretbetskaya. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 41-44.

Influence of preliminary heat treatment on the nitrided layer; quenching in water at 930° C. results in improved mechanical properties, achieved at a lower cost than with oil quenching. The sharp lowering of brittleness of nitrided layer in samples which were heated above 1000° C. is explained by the grawth in grain size and development of nitride network. (J28k, Q26s; ST)

219-J. (Russian.) **Survey of Technology of Steel Heat Treatment.** A. D. Assonov. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 58-64.

Survey of early and current practice in Soviet steel heat treating shops. Case hardening, surface hardening by induction and heat infrared heat, and heat treatment in controlled atmosphere. Improved heat treatment methods enable replacement of high-alloy steel by low-alloy fine-grained steel in manufacture of automobile parts. (J general; ST)

220-J. (Russian.) **Application of Induction Heating in Production of Automobile Springs.** V. N. Bogdanov. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 64-67.

Application of induction heating simplifies production of springs, especially bending and tempering. Details of experimental heat treatment. Two semi-automatic machines utilizing induction heating principle for spring bending, tempering and forming are described. (J2g, 1-2, T7c; ST)

221-J. (Russian.) **Increase of Wearing Qualities of Pneumatic Hammer Socket Pipes.** I. I. Lutomski. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 62-64.

The socket usually lasts one year unless it is heat treated. The most convenient way of heat treatment is nitriding. Detailed description of the process. The nitrogen hardened layer is 0.35-0.50 mm. thick; its impact resistance is approximately twice the value for an untreated surface. (J28k, Q9n; ST)

222-J. (Russian.) **Surface Hardening of Crank Pins With Gas-Oxygen Flame at High Rotating Speed.** M. L. Kazakov. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 67-70.

Process and plant for reconditioning tractor crankshafts using gas-oxygen flame. Any lathe of 30-100 RPM can be adapted. The process can be easily utilized by small workshops. (J2h, 1-2; ST)

223-J. (Russian.) **New Methods of Gas Heating.** B. F. Kopytov. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 53-57.

Heat treatment of parts by induction heating is too expensive. Local gas heating and infrared heating methods are recommended. Diagrams of the gas-air mixer and various burners as applied in local gas heating. (J2, W27q, 1-2)

224-J. Quench and Temper Process for the Manufacture of High Strength Tubular Products. H. B. Emerick. *Iron and Steel Engineer,* v. 34, July 1957, p. 124-130.

Process of continuous heating, water spray quenching and tempering is effective in producing high-strength tubular steel products needed for deep high-pressure oil and gas wells; mechanical properties for high-strength steels following quench and temper processes. (J26, J29, Q general; ST, SGB-a, 4-10)

225-J. Annealing of Zinc Base Die Castings. W. B. Stephenson, Jr. *Metal Treating,* v. 8, July-Aug. 1957, p. 6, 44, 45.

Experience in using heat treatment of 1 hr. at 410° F. to alleviate difficulties in electroplating due to presence of cold shot defects on casting surface. Treatment reduced hand buffing required after nickel plating and increased salt spray resistance of plated castings.
(J23; L17; Zn, *Ni,* 5-11)

226-J. Practical Heat Treatment for Titanium Alloys. P. D. Frost. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 307-312. (CMA)

Possibilities and problems of heat treating titanium and its alloys, based on the dependence of response to heat treatment on beta formers, the dependence of hardening on the solution, prevention of ductility loss by working and heating below the beta transus, and dependence of beta-phase stability on holding the last heat treatment between 800 and 1150° C. Beta stabilizers are only slightly soluble in alpha-titanium. 10 ref. (J general, N6p; Ti)

227-J. Versatile, Tailor-Made Heat-Treating. K. E. Henrikson. *Plant Engineering,* v. 11, Aug. 1957, p. 116-119.

Organization of a heat treat department; description of equipment. (J general, 1-2)

228-J. Modernized Heat-Treating Facility Pays Off. *Tool Engineer,* v. 39, Sept. 1957, p. 103-104.

New carburizing and marquenching of truck gears, kingpins and shafts reduce heat treating stresses. (J28g, J26p)

229-J. Thermal Annealing of Imperfections in the Noble Metals. J. S. Koehler, J. W. Henderson and J. H. Bredt. Paper from "Creep and Recovery", American Society for Metals, p. 1-13.

Survey of annealing data and association of each annealing drop with some atomic process. Four types of treatment which produce imperfections which can be annealed are considered. 36 ref.
(J23, M26s, EG-c)

230-J Mechanism of Annealing in Neutron Irradiated Metals. T. H. Blewitt, R. R. Coltman, D. K. Holmes and T. S. Noggle. Paper from "Creep and Recovery", American Society for Metals, p. 84-110.

Evaluation of various interpretations of annealing spectrum which arises as a result of low-temperature irradiation. 31 ref. (J23, 2-17)

231-J. (French.) **Influence of Austenitizing Temperature on Mechanical Characteristics and Hardenability of a Low-Alloy Cr-V Steel.** F. Maratray and G. Delbart. *Institut de Recherches de la Sidérurgie, Publications,* Ser. A, no. 152, Feb. 1957, p. 1-15. (Reprinted from *Revue de Metallurgie,* v. 53, Nov. 1956, p. 884-896.)

Experiments were conducted on samples of a 40-CV-4 type Cr-V steel produced in a high-frequency acid-bottom induction furnace. Austenization temperatures were scaled every 25° between 825 and 975° C. Jominy hardenability, hardness and microstructure after oil quenching reported. Discussion of mechanical characteristics after oil quenching and tempering includes: influence of duration of tempering operation on hardness and strength; study of indexes of quality after heat treatment; comparison of mechanical characteristics resulting from various austenitizing temperatures. 3 ref. (J22, J5, Q general, AY, *Cr, V*)

232-J. (French.) **Stepped-Frequency Induction Heating of Electromagnetic Parts.** J. Minssieux. *Revue Générale de l'Electricité,* v. 66, May 1957, p. 239-245.

Highly satisfactory treatment of steel bars is accomplished by initial heating to 700° C. with alternating currents of 50 hertz industrial frequency (exact frequency depending on size of bars), and completion of heating to 1250° C. with alternating currents at frequencies of about 1000 hertz. (J2g; ST, 4-5)

233-J. (German.) **Effect of a Final Annealing in High Vacuum on the Magnetic Reversal Loss of Hot and Cold Rolled Transformer Sheet.** Franz Lihl. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 223-228.

Magnetic, metallographic and radiographic tests on warm and cold rolled transformer sheet containing 4.3% silicon and 0.25% aluminum, after annealing in a high vacuum, indicate a reduction of magnetic reversal loss as compared to annealing in protective gases. 7 ref.
(J23, 1-23, P16; Fe, 4-3)

234-J. (Japanese.) **Change of Properties of Steel Caused by Low-Temperature Quenching. 4th Rept. Improvement of Notch Fatigue Strength.** Tadakazu Sakurai, Tadashi Kawasaki and Yukizumi Kita. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 489-494.

The effectiveness of low-temperature quenching in increasing fatigue strength and impact strength of steel. 21 ref.
(J26, 2-13, Q7a, Q6n; ST)

235-J. (Spanish.) **Age Hardening of Brasses Containing Zirconium or Titanium.** Sebastian Feliu Matas. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 160-165.

Study of behavior of four ternary copper-zinc base brasses (approx. 70% Cu, 30% Zn) when subjected to different aging treatments. Brass containing 0.56% Zr does not age harden. Brasses with additions of Ti harden under appropriate treatment. Brass containing 1.35% Ti shows hardness increase of 50% after aging 24 hr. at temperatures of 350 to 450° C. 7 ref.
(J27d; Cu-n, *Zr, Ti*)

236-J. (Spanish.) **Surface Hardening by High-Frequency Induction Heating. Physical Principles and Metallurgical Factors.** Miguel P. de Andrés. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 200-210.

Depth of penetration, importance of frequency selected on desired characteristics; thermal effects in a piece of steel treated by high-frequency induction heating and reasons justifying use of this method; basic metallurgical factors in surface hardening process and their influence on mechanical properties of steel; technical and economic advantages of process. 11 ref.
(J2g; ST)

237-J. (Book—French.) **Heat Treatment as Practiced in the Metal Industries.** Gerald de Smet. 1957. 466 p. 5th Ed. Dunod, 92 Rue Bonaparte, Paris 6ᵉ, France. 3,300 Fr.

Subjects discussed include: iron smelting and steel manufacture; influence of alloying additions; classification of iron and steel; types of heat treatment such as annealing, normalizing, quench hardening, case hardening, nitriding, tempering; industrial applications; pyrometry; furnaces, nonferrous metals such as aluminum and light alloys; mechanical and physical tests. (J general)

238-J. (Book—French.) **Heat Treatment of Construction Steels.** Andre Sourdillon. 363 p. 1957. 2nd Ed. Editions de la Revue d'Optique, Paris.

Comprehensive coverage of constitution, structure, properties of common and alloy construction steels and effects of annealing, hardening treatments, tempering, cementation, etc.; execution of heat treatments; control of treated material. For those with prior knowledge of subject.
(J general; ST, SGB-s)

K Assembling and Joining

397-K. Welded Wire Mesh and Wire Screening. A. Jasper. *Draht (English Edition),* no. 28, Apr. 1957, p. 15-21.

Material used, machines for straightening and feeding wire, resistance welding procedure and details of electrical and control equip-

ment for welding wire mesh; welded steel mesh used for reinforcing concrete and glass. 5 ref.
(K3, K13s; ST, 4-11)

398-K. You Can Weld Paper-Thin Stainless. J. C. Collins and S. P. Jenkins. *Industry and Welding,* v. 30, Aug. 1957, p. 42-44, 74, 76.

Problems and solutions of butt welding along 72-in. length of stainless steel 0.005 in. thick for exterior skins of supersonic aircraft.
(K1; SS, 4-6)

399-K. How To Braze Titanium. Harry Schwartzbart. *Iron Age,* v. 180, Aug. 1, 1957, p. 100-103. (CMA)

Titanium and its alloys can be successfully brazed by a number of processes, including torch, furnace, induction and resistance heating. Silver and its alloys are favored filler metals, since their intermetallic compounds with titanium are relatively ductile. Current studies are concerned with the addition of lithium to silver-base alloys to increase their wettability and lower the melting point. (K8; Ti)

400-K. Automatic Spot Welding of Aluminum. *Light Metal Age,* v. 15, June 1957, p. 10-12.

Large spot welding units with tape-controlled positioning tables spot weld large contoured aircraft panels. (K3n, 1-2; Al)

401-K. Basic Factors in Brazing Alloy Selection and Joint Design. Lester F. Spencer. *Tooling and Production,* v. 23, Aug. 1957, p. 93-97.

Brazing methods, properties and recommended applications of brazing metals and alloys. 4 ref.
(K8, 17-1; SGA-f)

402-K. Metallurgy of Welding of Certain Austenitic Heat and Corrosion Resistant Alloys. Anthony H. Waterfield and Russ P. Culbertson. *Welding and Metal Fabrication,* v. 25, July 1957, p. 244-250.

Nickel-base, cobalt-base and iron-base alloys and methods for welding them are considered. Most welding methods available for stainless steels can be used provided proper precautions are observed.
(K general; SS-e, Ni, Co, Fe)

403-K. Tig—for the Metals That "Couldn't be Welded". Jack Fairlie. *Welding Engineer,* v. 42, June 1957, p. 32-37.

History of process, current selection, four steps in torch manipulation and future for Tig. (K1d)

404-K. Tig and Magnesium Allies in Design for Strength. Jack Fairlie. *Welding Engineer,* v. 42, June 1957, p. 44-45.

Tig process at Magcoa more economical than Mig. (K1d; Mg)

405-K. British Weld Studs for Plane Test Sites. William A. Heath. *Welding Engineer,* v. 42, July 1957, p. 39.

Stud welding of new closed-circuit supersonic wind tunnel at the Royal Aircraft Establishment. (K1f)

406-K. Vacuum Brazing Economical Method for Large, Continuously Bonded Multi-Metal Assemblies. R. C. Bertossa. *Western Metals,* v. 15, July 1957, p. 58-60.

Vacuum brazing of large surface areas, cladding carbon steels, stainless and nonferrous metals with corrosion or oxidation resistant materials such as high-temperature alloys, stainless, titanium, etc.
(K8, 1-23, L22; SGA-g, SGA-h)

407-K. Some Problems of the Metallurgy of Semi-Automatic Welding of Stainless Steel Using Unfused Siliceous Fluxes. A. I. Akulov. *Avtomaticheskaya Svarka,* v. 8, 1955, p. 50-54. (*Henry Brutcher Translation* no. 3794.)

Interaction between flux and metal in weld puddle; effect of ferrosilicon as compared to silica, upon silicon content of weld metal; introduction of ferrosilicon into the flux to minimize loss of chromium by oxidation and to insure the required contents of silicon and manganese in weld; results obtained with unfused fluxes in the welding of titanium-stabilized stainless steels.
(K9n, K1; RM-q, SS)

408-K. (Spanish.) **Welding Provides Economy and Speed in Repair of Rolling Stock of Italian Government-Owned Railways.** Carlo Bologni and Mario Voltolini. *Ciencia y Técnica de la Soldadura,* v. 7, May-June 1957, 10 p.

Methods and techniques used in construction and repair of fire boxes, application of metal banding to wheel hubs, repair of rolled steel wheels of diesel locomotives, spokes and hubs of electric and steam locomotives, locomotive cylinders, electric locomotive bogies, diesel engine cylinder heads, etc.
(K general, T23, 18-22)

409-K. (Russian.) **High-Speed Steel Welding Alloys.** M. S. Polyan. *Stanki i Instrument,* v. 28, Jan. 1957, p. 30-31.

Generally four carbide-forming elements are used in alloying: Cr, W, Mo, and V. From 5 to 10% cobalt is also added, which slows down diffusion and increases durability at high temperature; graphs of hardness versus temperature for eight alloys. 3 ref. (K9s, 2-10; TS-m)

410-K. Fundamentals of Brazing. N. Bredzs and H. Schwartzbart. Armour Research Foundation. Army Ordnance, *U. S. Office of Technical Services,* PB 121553, Dec. 1955, 101 p. $2.75.

Concerned with two fundamental problems—the mechanism of the formation of the metallic bond in a brazed joint; and correlation between the bonding mechanism and the strength of brazed joints. (K8)

411-K. Fundamental Studies on the Adhesion of Organic Materials to Metal Substrates. R. L. Patrick and W. A. Vaughan. Quantum, Inc. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 121982, Dec. 1956, 121 p. $3.25.

Investigation of the controlling factors which influence the bonding of adhesives and coatings. Model systems were prepared by depositing monolayers on substrates with weight added as bulk polymer polymerized directly onto the monolayer. The samples were then ruptured.
(K12)

412-K. Research on Elevated Temperature Resistant Ceramic Structural Adhesives. Pt. 2. H. G. Lefort, R. M. Spriggs and D. G. Bennett. University of Illinois. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121941, Jan. 1957, 74 p. $2.

Adhesives were found which yielded 1200 psi. shear strength at room temperature; others 1100 psi. at 600° F; 1500 psi. at 800° F; 2300 psi. at 900° F.; and 800 psi. at 1000° F. No single adhesive, however, possessed all of those strengths. Best performance was shown by porcelain enamel ceramic adhesives with thermal expansion approaching that of ingot iron. (K12, 2-12)

413-K. Elevated Temperature Resistant Silicone Structural Adhesives for Metals. F. J. Riel, Jr., and M. B. Smith. Narmco, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131024, Mar. 1957, 41 p. $1.25.

The first type of materials studied, polymers made from polyhydroxy compounds and halosilanes, proved too susceptible to hydrolysis. The second line of approach was the synthesis of polysiloxane and polysilane resins containing tolyl groups, followed by oxidation of the tolyl groups to polar carboxyphenyl groups. Evaluation of the carboxyphenyl polysiloxanes showed them to be better high-temperature resistant laminating resins than metal-to-metal adhesives when compared to conventional commercially available silicones. (K12)

414-K. On the Mechanism of Hot Cracking of Welds. V. A. Toropov. *Metallovedenie i Obrabotka Metallov,* June 1957, p. 54-58. (*Henry Brutcher Transalation* no. 3982.)

Critical literature review; dependence of resistance of weld metal to hot cracking upon temperature and nature of solidification of the constituents making up the intergranular substance; limitations to this relationship; study of certain ternary alloys having a eutectic; examples; possibility of improving the resistance to weld hot cracking by changing the relative quantities of intergranular constituents or by introducing new ones. (K9n, 9-22)

415-K. Segregation in Fusion Zone and in Solidification Layers as Related to the Diffusion Between Solid and Liquid Phases in the Freezing of Welds. A. M. Makara and A. A. Rossoshinskii. *Avtomaticheskaya Svarka,* v. 9, no. 6, 1956, p. 65-76. (*Henry Brutcher Translation* no. 3991.)

Study of heterogeneity in fusion zone and solidification layers formed directly during the welding of alloy steels, to throw light on such practical problems as cracks in the weld metal and the latter's mechanical properties. Bearing of diffusion between co-existing solid and liquid phases (due to the greater solubility of such elements as C, S and P in liquid than in solid steel) on this heterogeneity which develops during the welding process proper and independently of what happens in subsequent heat treating or high-temperature service. Causes of periodicity of solidification of weld metal. (K9n, N12)

416-K. (French.) **Vast Possibilities of Welding in the Field of Parts Subject to Heavy Stresses.** Albert Maier. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 78-92.

Materials and welding techniques applicable to construction of equipment for the chemical industry, steam boilers and hydraulic installations in particular. Urges expanded use of welding in construction of thickwalled bodies destined to withstand heavy pressures. 4 ref.
(K general, T29, T26q)

417-K. (French.) **Contribution to the Study of Sealing Runs in Arc Welding.** J. Daivier. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 102-111.

Verification by X-ray and mechanical tests of complete penetration of welds finished by means of elec-

trodes and without prior chipping or chiseling. Whichever the type of joint, sealing runs made with electrodes providing deep penetration and by automatic welding give perfect welds. (K1, K9n)

418-K. (French.) **Classification of Steels Suitable for Welded Construction.** M. W. Bonhomme. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 112-116.

Discussion of work of Commission on Effects of Welding on the Behavior of Metals of International Welding Institute in attempting to establish weldability norms, with special attention to problem of brittle fracture. (K9s, Q26s; ST)

419-K. (German.) **Efficient Production With Special-Purposes Resistance Welding Machines.** F. Lambrecht. *Schweissen und Schneiden,* v. 9, July 1957, p. 355-358.

Requirements for the application of special-purpose welding machines; special designs illustrated and described. (K3, 1-2)

420-K. (German.) **Interesting Problems in Welding Applications in a Gas Distribution Plant.** H. Jürgens. *Schweissen und Schneiden,* v. 9, July 1957, p. 358-360.

Development of welded branch pipes for cast mains; manufacture and fitting; protection against corrosion by flame cleaning and plastic coating. (K general, 4-10)

421-K. (Italian.) **History and Influence of Welding in Naval Construction.** Franco Salerno. *Rivista Italiana della Saldatura,* v. 9, Mar-Apr. 1957, p. 64-68.

Description of first arc welding applications in shipbuilding during World War II by U. S. Maritime Commission; principal causes of ship failures and how they have been overcome by improvements in design and steel specifications and by arc welding processes; advantages of welded construction, including prefabrication, structural lightness and reduced labor time. (K general, T22)

422-K. (Russian.) **Energy Consumption of Electric Welding Apparatus in Pipe Production.** V. P. Anisiforov and F. P. Kirpichnikov. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 31-35.

Energy consumption is measured in the operation of two identical units, making 51 × 2.0 to 152 × 6.0-mm. pipe. Graph of energy consumption according to wall thickness of the pipe. (K1, 1-2; 4-10)

423-K. Flexible Plates for 8-Ft. Supersonic Tunnel at the R.A.E., Bedford. T. Nellis and T. S. Burns. *British Welding Journal,* v. 4, Aug. 1957, p. 345-353.

Fabrication of three large flexible steel plates and procedure for each welding operation.
(K general; ST, 4-3)

424-K. Welding of Aluminum Tanks for Experimental Reactors. J. F. Lancaster. *British Welding Journal,* v. 4, Aug. 1957, p. 354-360.

Fabrication problems and methods of overcoming them, such as welding of dissimilar and variable thicknesses of pure aluminum plate and cracking in 99.8% purity aluminum fillet welds. 5 ref.
(K general, W26q; Al)

425-K. A Century of Resistance Welding. H. J. Nichols. *Canadian Metalworking,* v. 20, July 1957, p. 38-41.

History of development of resistance welding; processes for butt seam, spot and flash welding.
(K3, A2)

426-K. Have You Considered Silver Brazing? A. M. Setapen. *Design Engineering,* v. 3, Jan. 1957, p. 29-33, 51.

Attributes include flexibility and ability to produce strong, uniform joints in a large variety of metals. Brazing with silver alloy filler metals is a quick, convenient, clean method for joining any combination of light or medium-gage metals whose melting points are above approximately 1500° F.
(K8; SGA-f, Ag)

427-K. Dielectric Heat Cooks Metal Sandwiches. Don W. Cole. *Metalworking Production,* v. 101, Aug. 9, 1957, p. 1377-1380.

Possibilities of radio-frequency heating for adhesive bonding of metal sandwiches. (K12, W29n, 1-2)

428-K. Brazing for High Temperature Use. G. S. Hoppin, III. *Steel,* v. 141, Aug. 26, 1957, p. 82-86.

Application of brazing in assembly of variety of jet engine components; brazing with nickel-base alloys in dry hydrogen atmospheres provides method for joining stainless steel and other alloys used at high temperatures but problems of erosion, brittleness, adverse thermal effects and need for high purity of atmosphere require close process control.
(K8, 2-12; SGA-h)

429-K. Developments in the Argon-arc Spot Welding Process. J. L. Steer and F. W. Copleston. *Welding and Metal Fabrication,* v. 25, Aug. 1957, p. 282-288.

Features of process as applied to stainless steel such as economy, quality and consistency.
(K1d, K3n; SS)

430-K. (French.) **Assembly of Laminated Parts.** J. Ch. Vienot. *Chimie et Industrie,* v. 77, May 1957, p. 1038-1042.

Solid assembly can be achieved in small complex parts by means of leaves stacked to give desired shape. Of various methods of joining the lamellae, most interesting appears to be by means of "fusion" of the metallic films electrolytically deposited on each of the surfaces to be joined. 5 ref. (K12)

431-K. (French.) **Welding in the Construction of Equipment for Highway Transport.** E. Demaret. *Revue Universelle des Mines,* v. 13, Aug. 1957, p. 395-404.

Study of residual tensions and brittle fracture enables formulation of design principles for arc welded frames and chassis and for execution and control of arc welds. Improvements in resistance welding machines open way to new time and money-saving applications of welding. Detailed listing of applications to vehicle construction of each type of welding. 31 ref.
(K1, K3, T21e, 17-1)

432-K. (German and French.) **Present State and Future Development of the Arc Welding of Steel.** M. E. Folkhard. (Continued.) *Zeitschrift für Schweisstechnik,* v. 47, Aug. 1957, p. 192-197.

Several welding methods are surveyed including carbon dioxide submerged arc welding, the Unionarc process and Tig welding. 3 ref.
(K1; ST)

433-K. (Spanish.) **Multiple-Spot Welding Methods for High Speed Production.** H. W. Roth. *Ciencia y Técnica de la Soldadura,* v. 7, May-June 1957, 6 p.

Description, advantages and disadvantages of three methods: hydromatic, ultra-rapid, multiple transformer. (K3n)

L Cleaning Coating and Finishing

465-L. Precision Barrel Finishing. Pt. 3. William E. Brandt. *Automatic Machining,* v. 18, Aug. 1957, p. 48-52.

Types of tumbling barrel media; abrasive cutting, nonabrasive cutting, burnishing and coloring, washing and rust prevention, descaling of ferrous metals and bleaching of nonferrous metals, metals and jobs for which compounds are best suited.
(L10d)

466-L. Wire Lacquering Machines. Friedmund Rub. *Draht (English Edition),* no. 28, Apr. 1957, p. 32-34.

Equipment for even and speedy application of lacquers to copper and nickel-chromium wires. (L26n, 1-2)

467-L. Kinetic Studies on Formation of Black-Oxide Coatings on Mild Steel in Alkaline Nitrite Solutions. Ray M. Hurd and Norman Hackerman. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 482-485.

Studies made over range from 130 to 150° C. Over-all mechanism for formation of black oxide is proposed. 4 ref. (L14a; ST)

468-L. Study of Cathode Potentials in Aqueous Tungstate Solutions. D. R. Markwell and M. L. Holt. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 488-493.

Cathode potential measurements used to obtain information about the cathode process that results in electrodeposition of tungsten alloys. 15 ref. (L25h; W)

469-L. A Guide to Stainless Steel Finishing. W. E. McFee. *Grinding and Finishing,* June 1957, p. 39-44.

Types of flexible grinding and polishing wheels and belts and basic rules for applying for surface finishing. Instructions for heading wheels in the shop. (L10b; SS)

470-L. Vapor Degreasing Cleans Metal Parts for Painting. *Industrial Finishing,* v. 32, July 1957, p. 42-46.

Advantages of process; equipment used. (L12j, 1-2)

471-L. Aluminium Anodising Based on American Experience. *Industrial Finishing,* v. 9, July 1957, p. 692-695.

Dependence of coating weight and thickness upon oxidation time and current; effect of alloy composition on coating; utilization of anodized aluminum in automobile trim.
(L19; Al)

472-L. Application of Vitreous Enamels on Aluminium. A. H. Symonds. *Industrial Finishing,* v. 9, July 1957, p. 702-703.

Suitable alloy compositions for application of vitreous enamels to aluminum in the form of sheet, extruded sections or cast material; enamel application method and variations in enamel weight. (L27; Al)

473-L. Surfacing With Stainless Prevents Pit Corrosion. J. A. Rau. *Iron Age,* v. 180, July 18, 1957, p. 120-121.

Shafts of extrusion presses receive protective coating of stainless steel deposited with automatic submerged arc welding. (L24, R2j; SS)

474-L. Milling Aluminium Enamels. N. G. Guy. *Light Metals,* v. 20, June 1957, p. 180-181.

Recommended mill additions are sodium metasilicate and boric acid. Cleaning and pretreatment of alu-

minum prior to enameling; storage of aluminum enamels. (L27; Al)

475-L. Firing Aluminium Enamels. T. B. Vaughan. *Light Metals,* v. 20, June 1957, p. 181-183.

Requirements include correct temperature and time in furnace, correct support of and uniform heating of ware, dust-free atmosphere. Factors influencing firing time and temperature. Furnaces used.
(L27; Al)

476-L. Application of Vitreous Enamels on Aluminum. A. H. Symonds. *Light Metals,* v. 20, June 1957, p. 183-184.

Compositions of aluminum sheet and castings suitable for enameling. Spraying, dipping, drying, brushing and tests for finished product.
(L27; Al)

447-L. Vitreous Finish for Aluminium. *Light Metals,* v. 20, June 1957, p. 180-184.

Three papers presented at Ferro Enamels, Ltd., refresher course. Papers are separately abstracted.
(L27; Al)

478-L. Vapor Blasting Deburrs and Blends Machined Surfaces. Ray Furgeson and John E. Eggum. *Machinery,* v. 63, July 1957, p. 180-183.

Continuous process of deburring wing panels by spraying with mixture of water, abrasive particles and compressed air. (L10c)

479-L. Electroplating Is an Important Step in the Construction of a Man-Made Satellite. George W. Grupp. *Metal Finishing,* v. 55, July 1957, p. 40-44.

Sequence of operation used in gold plating space satellite.
(L17; *Au*)

480-L. What Size Filter? Gunnar Gabrielson. *Metal Finishing,* v. 55, July 1957, p. 50-51.

Mathematical analysis of system for continuous removal of impurities from electroplating solutions.
(L17, 1-2, A8b)

481-L. Finishing Pointers. Life of Alkaline Cleaning Baths. J. B. Mohler. *Metal Finishing,* v. 55, July 1957, p. 57, 67.

Note on control of alkaline cleaning bath composition and estimation of bath life. (L12k)

482-L. Efficient Cleaning Methods. L. F. Spencer. *Metal Industry,* v. 91, July 12, 1957, p. 29-32.

Recommendations on selection of cleaning materials and cleaning equipment for preparing metal surfaces for finishing. (L10, L12)

483-L. Finishing of Zinc Alloy Die-Castings. J. Edwards. *Metal Industry,* v. 90, June 28, 1957, p. 547-550.

Explanation and measures for elimination of defects such as process blistering and service blistering which occur in copper, nickel and chromium coatings electrodeposited on zinc die castings; control of coating thickness and properties of electrodeposits; other coating methods. 32 ref.
(L17, L general; Zn, 5-11, 9-21)

484-L. Deburring Gets Down to Millionths of an Inch. *Metalworking,* v. 19, Aug. 1957, p. 3-5.

Aluminum, stainless steel and copper alloys parts for inertial guidance systems are deburred and finished by precision barrelling and electropolishing. (L10d, L13p; Al, SS, Cu)

485-L. Nickel Will Stretch. Cleveland F. Nixon. *Plating,* v. 44, July 1957, p. 757-762.

Methods at General Motors to conserve nickel in plating operations. Conclusions based on acetic acid spray test results. (L17; *Ni*)

486-L. Phosphating Processes and Their Applications in Metal Finishing. Pt. 2. Choice of Plant. D. J. Fishlock. *Product Finishing,* v. 10, July 1957, p. 73-85.

Metal cleaning practice and layout of plant for phosphating operations. 11 ref. (L14b, W10a, 18-17)

487-L. "Plasteel." Description of the British Iron and Steel Research Association Plant and Process for Producing P.V.C.-Coated Steel Strip. W. Bullough and T. A. Canning. *Sheet Metal Industries,* v. 34, June 1957, p. 431-433.

Method for bonding thin film of polyvinyl chloride to flat steel sheet or strip. Laminate remains bonded following sharp bend for drawing operations. (L26p; ST)

488-L. New Process for the Production of Plastic-Coated Sheet. "Mechanical Bond" Eliminates Adhesives. *Sheet Metal Industries,* v. 34, July 1957, p. 526-527.

Mechanical bond obtained by perforating aluminum or steel sheet with small closely adjacent holes and forcing plastic material through holes to anchor plastic. (L26p)

489-L. Cheaper Cleaning. Mechanical Blast Descaling Cuts Cost for Strip and Sheet Processes. E. F. Anderson. *Steel Processing and Conversion,* v. 43, July 1957, p. 396-397.

Advantages of descaling steel strip by centrifugal blasting with steel shot. (L10c; ST, 4-3)

490-L. Protection of Uranium: Vapor-Deposited Coatings. I. E. Campbell, E. M. Sherwood, C. F. Powell and R. P. Jones. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-887, Nov. 24, 1953, 19 p.

The most satisfactory vapor-deposited coatings on uranium were obtained by a displacement-diffusion process similar to pack chromizing, employing the vapors of the lower zirconium iodides. (L25; U)

491-L. Degreasing and Pickling of Uranium Chips. B. G. Ryle, R. W. Vest and J. F. Blum. National Lead Co. of Ohio. *U. S. Atomic Energy Commission,* FMPC-497, Dec. 1, 1954, 18 p.

The relative efficiency of detergents and an organic solvent (trichloroethylene) as degreasing agents investigated. The effects of temperature, nitric acid concentration and immersion time studied to determine conditions necessary to obtain the most complete oxide removal with the minimum loss of uranuim metal. (L12; U)

492-L. (Japanese.) **Surface Treatment of Metals.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 630-635.

Various methods for coating nickel, copper, cadmium, zinc, iron and noble metals; mechanism of anode treatment and anodic oxidation. 102 ref. (L general, L19; Ni, Cu, Cd, Zn, Fe, EG-c)

493-L. (Russian.) **Increasing Polishing Efficiency.** D. V. Charnko and L. V. Khudobin. *Stanki i Instrument,* v. 28, Apr. 1957, p. 11-13.

Instruments measuring the pressure on the working surface are recommended. Detailed description and diagrams of the arrangement for measuring the force applied to the polished surface. (L10b)

494-L. Production of Thin Layers of Plutonium, Americium and Curium by Electrodeposition. G. N. Yakovlev, P. M. Chulkov, V. B. Dedov, V. N. Kosyakov and Yu. P. Sobolev. *Soviet Journal of Atomic Energy,* no. 5, 1956, p. 813-815. (Translated by Consultants Bureau, Inc.)

The elements were deposited in the form of hydroxides from neutral and weakly acidic alcoholic acetone solutions of the chlorides.
(L17; Pu, Am, Cu)

495-L. Titanium Coating and Its Application. Pt. 2. T. Yamaguchi and T. Takei. *Tokyo, Scientific Research Institute, Journal,* v. 51, June 1957, p. 75-81. (CMA)

Titanium alloy cementation coatings were studied at normal and high temperatures. They are almost as resistant to aqueous media as titanium, although high temperatures decrease the resistance. The coating compositions prepared were TiAl, Ti + Al (powder), $TiAl_3$, TiSi, TiNi, and TiNi + TiO_2. Scaling resistance was studied for sulphur-containing atmospheres. The Ti-Al mixture gave the best results.
(L15, R general, 2-12; Ti, 8-24)

496-L. Heat Resistant Paints for Rocket Launchers. T. Rice. Rock Island Arsenal Laboratory, *U. S. Office of Technical Services,* PB 121736, Sept. 1956, 12 p. 50¢.

A zinc dust pigmented dibutyl titanate resin-type paint displayed superior resistance to a short blast of flame similar to that produced during rocket firing. Resistance of an aluminum pigmented silicone resin-type was also excellent, but was rated somewhat lower than that of the zinc DBT composition.
(L26n, 2-12)

497-L. Electrodeposition of Titanium on Base Metals. M. E. Sibert. U. S. Air Force, Wright Air Development Center, Technical Report 53-503. *U. S. Office of Technical Services,* PB 121958, Dec. 1953, 34 p. (CMA)

The electrolytic cladding of base metals with titanium was achieved through the use of fused salt bath under inert gas and high temperatures (850° C.). Clads of the 0.003 in. were obtained with a diffusion-type bond. Thick layers may be produced by repetitive electrolysis. The usual bath composition contained K_2TiF_6. (L17; *Ti*)

498-L. Electrodeposited Foils for Use as Magnetic Materials in Communication Technology. F. Khol. *Slaboproudy Obzor,* v. 16, no. 6, 1955, p. 323-327. (*Henry Brutcher Translation* no. 3974.)

Production of foils of pure iron or iron-nickel compositions by electrolytic deposition rather than by cold rolling; properties required of such foils; production process suggested for iron foil; deposition conditions for the continuous production of 50% Fe, 50% Ni strip for toroidal windings; proposed layout of plant; magnetic properties as function of heat treatment of foils.
(L18; Fe, Ni, SGA-n, 4-6)

499-L. (French.) **Preparation for Electroplating of High-Carbon Steels.** *Galvano,* no. 246, July 1957, p. 19-22.

Operational cycle is aimed at the reduction of hydrogen embrittlement and obtaining maximum adherence of the electrodeposited metal. Degreasing, mechanical treatment, scouring, anodic acid treatment, heat treatment after electroplating.
(L general, L17)

500-L. (French.) **Electrodeposition of Rhodium.** *Galvano,* no. 246, July 1957, p. 26-28.

Use of rhodium as a hardening agent for platinum; methods of purification and application; types of

rhodium solutions; effects of metallic impurities in rhodium solutions. (To be continued.) (L17; Rh)

501-L. (French.) **Automatic Galvanizing of Propellers.** *Galvano,* no. 246, July 1957, p. 29-32.

Description of new zinc plating installation at Hamilton Standard Division of United Aircraft Corp. (L16; *Zn*)

502-L. (French.) **Anodic Film Protection of Aluminum and Aluminum Alloys.** W. Wiederholt. *Revue de L'Aluminium,* no. 245, July-Aug. 1957, p. 721-733.

Necessity for control of thickness and density of oxide coatings; measurement of coating thickness by microscope, chemical means and by the use of the isometer; colorimetric determination; permeability and efficiency of the various sealing processes; corrosion tests enabling accurate quality control of oxide coatings insuring efficient protection in normal atmospheres. 9 ref. (L19, S14; Al)

503-L. (French.) **Surface Treatment of Aluminum and Aluminum Alloys. Coating by Means of Paints and Varnishes. Pt. 1. Protective Varnishing.** Jean-Jacques Meynis de Paulin. *Revue de L'Aluminium,* no. 245, July-Aug. 1957, p. 757-765.

Aluminum can most profitably be varnished to retain its fine aspect. Satisfactory results are obtained with furnace-glazed synthetic varnish baked at high temperature and more especially with certain methacrylic varnishes. (L26n; Al)

504-L. (German.) **Formation and Growth of Protective Layers on the Surface of Aluminum.** Hans Ginsberg. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 357-360.

Current-voltage curves are measured during the formation of the eloxal layers in slightly dissolving electrolytes after different surface treatments. The effect of irradiation before and after sealing of the layer is reported, and the results of microchemical investigations of the layers are discussed. (L14, 2-17; Al)

505-L. (German.) **Burnishing, a Method for Improving the Surface Finish Without Removal of Metal.** Helmut König. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 336-370.

The practical application of a smooth rolling burnishing technique is described by examples and with reference to deformation processes in the surface. Smooth rolling changes surface hardness and internal stresses as well as surface roughness, so that there are limits to its applicability. Economic estimates show the advantages of this technique. (L10b)

506-L. (Italian.) **High-Vacuum Metallizing of Plastic Materials.** G. Zanini. *Materie Plastiche,* no. 5, May 1957, p. 381-383.

Aluminum, copper, steel and gold are used for coating jewelry and other objects where attractive appearance is significant. Surface finish of article to be treated must be as perfect and clean as possible, as a grain of dust or a fingerprint is greatly magnified in the metal coating. (L23, 1-23; *Al, Cu, ST, Au*)

507-L. (Japanese.) **Effect of Temperature on the Passivity of Nickel.** Go Okamoto, Haruo Kobayashi, Norio Sato and Masaichi Nagayama. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 199-203.

Determination of passivity of nickel by potentiostatic method; effect of temperature, current density and frequency on the impedance of passive nickel in sulphuric acid. 21 ref. (L17; *Ni*)

508-L. (Russian.) **Depth of Sulphur-Enriched Layer of Steel and Cast Iron on Sulphidizing.** G. V. Karpenko, A. N. Tynni and Yu. I. Babei. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 61-62.

Experiments using S_{35} isotope. Depth of the layer is estimated as 0.015-0.016 mm. for the steel and 0.034 mm. for the cast iron. 4 ref. (L15; ST, CI, *S*)

509-L. Wettability in Enamel-Metal Systems. Robert M. King and Ralph L. Cook. *American Ceramic Society Bulletin,* v. 36, Aug. 1957, p. 293-296.

Determination of wettability of enamel-grade iron by molten enamel under various conditions of oxidation in wet and dry atmospheres. 10 ref. (L27; CI)

510-L. Hard Nickel Plating Makes Molds and Saves Molds. Charles Emerson. *American Machinist,* v. 101, July 1, 1957, p. 85-87.

Accurate built-up molds for plastic parts made by silver spraying the master part, then plating on hard nickel and copper. (L17; *Ni*, NM-d)

511-L. Permanent Forms of Metal Protection. Stanley Wright. *Cleaning and Maintenance,* v. 5, Aug. 1957, p. 39-42.

Metallic, organic and phosphatic coatings. (L general)

512-L. Annual Conference, Institute of Metal Finishing. *Electroplating and Metal Finishing,* v. 10, May 1957, p. 136-151.

Comprehensive abstracts of papers presented at conference. Mechanism of leveling in electrodeposition; influence of periodic reverse of current upon surface roughness; properties of coatings formed by chromic acid anodizing; peen plating; electrodeposition of tin as bright coating; cathodic polarization of nickel; continuous measurement of stress in electrodeposits; effect of chromium and nickel plating on fatigue properties; adhesion; spray booth design and control of spraying; cleaning intricate parts. (L general)

513-L. Problems of Spray Suppression in Chromium Plating. P. J. Ramsden. *Electroplating and Metal Finishing,* v. 10, May 1957, p. 152-155.

Application of surface active agents to chromium plating solutions to reduce mist and spray formation. (L17; *Cr*)

514-L. Bright Nickel Plating on Cast Iron. E. Alary. *Electroplating and Metal Finishing,* v. 10, July 1957, p. 227-230.

Problem and final procedure developed in plating copper on sand castings of iron followed by polishing and bright nickel plating. (L17; CI, *Cu, Ni*)

515-L. Systems for Finishing Magnesium. *Industrial Finishing,* v. 9, Aug. 1957, p. 736-742.

Cleaning, acid pickling and treating steps; surface stability and corrosion problems. (L general; Mg)

516-L. Plating and Painting at London Airport. *Industrial Finishing,* v. 9, Aug. 1957, p. 755-756.

Processes and equipment used by the British Overseas Airways Corp. in maintaining their aircraft. (L17, L26n; T24, 18-21)

517-L. Zinc and Phosphate Coatings. N. E. Hays. *Industrial Finishing,* v. 9, Aug. 1957, p. 757-759.

Relative merits of zinc coated and phosphated sheets. Comparative advantages of buying mill-phosphatized sheets and installing phosphate treating equipment in the manufacturing plant. (L14b, L16; ST, *Zn*)

518-L. Effect of Silicon in a Low-Alloy Steel on the Adhesion of Heavy Nickel Plating. J. J. Dale and H. K. Lutwak. *Institute of Metal Finishing, Bulletin,* v. 7, no. 2, Summer 1957, p. 133-138.

Evidence obtained by treating anodically etched steel with sodium hydroxide indicates presence of film of silicic acid which permits proper adhesion of subsequent nickel deposits. Silicic film formed on silicon-containing alloy steel following anodic etching in sulphuric acid. 16 ref. (L17, L19n; AY, *Ni*)

519-L. Two Tanks Do Work of Ten in Surface Treatment. C. J. Riddle. *Iron Age,* v. 180, Aug. 22, 1957, p. 104-105.

Cycling of solutions cuts number of tanks needed for anodizing aluminum aircraft components from ten to two. (L19, W3g, 1-2; Al)

520-L. Washing-Machine Tubs Slip-Coated Automatically. John H. Bauer. *Machinery,* v. 64, Sept. 1957, p. 178-179.

Ground coat of slip is obtained mechanically at the Whirlpool-Seeger Corp. by rotating tubs slowly on a spider and shaking them intermittently to remove excess slip. (L27)

521-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, July 26, 1957, p. 63-65.

Abrasion resistance of oxide coating produced on commercially pure aluminum sheet anodized using a constant wattage power input with sulphuric acid electrolyte; effects of varying electrolyte concentration, wattage and temperature. (To be continued.) (L19n; Al)

522-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 2, 1957, p. 90-92.

Effect of alloy compositions and pretreatment on thickness, abrasion resistance and color characteristics of anodized aluminum coatings produced in sulphuric acid electrolyte under direct current with constant wattage. (To be continued.) (L19n; Al)

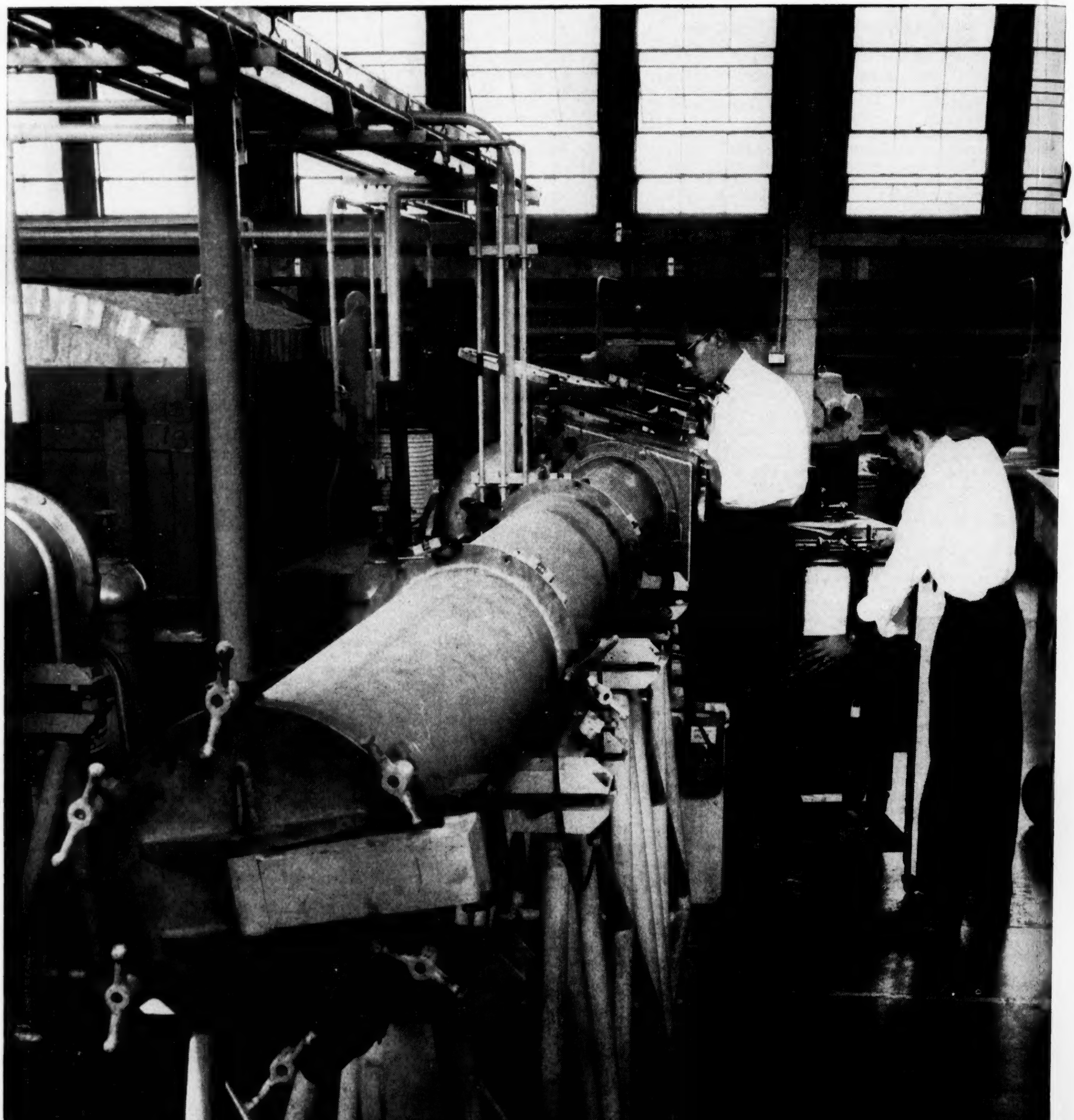
523-L. Steel Grit Abrasive Advantageous in Blast Cleaning Heat Treated Parts. Eugene F. Anderson. *Metal Treating,* v. 8, July-Aug. 1957, p. 8, 42.

Desirability of steel grit abrasive compared to chilled iron abrasive for centrifugal blasting of hardened steel part in tumble-blast units. (L10c, W2a, 17-7; ST)

524-L. Physical Properties of Electrodeposited Metals. T. E. Such. *Metallurgia,* v. 56, Aug. 1957, p. 61-66.

The wide variations in physical properties; tensile strength, ductility, hardness and internal stress that can be obtained in electrodeposited metals. Description of way in which these metals and articles plated with them are affected by changes in these properties, and methods for their determination. 24 ref. (To be continued.) (L17c, Q general; 8-12)

525-L. Protecting Sheet-Steel Products. A. N. Laubscher and C. P.



James G. Goodwin (Penn State '51), Senior Engineer in the Special Materials Section of Bettis Atomic Power Division, on left, examines a completed weld made on the central thimble tube. Mr. Goodwin directed the program to develop the proper process for fabricating Zircaloy-2 Pressure Vessel for irradiation studies. Richard M. Lieberman (Lafayette '52), Associate Engineer in the Loop Design and Operation Group, checks voltage and amperage records of the welding performance.

METALLURGICAL PROCESS DEVELOPMENT

Fabrication of Zircaloy-2 Pressure Vessel for Irradiation Studies

To test fuel elements being developed for a pressurized water reactor, engineers at Bettis Atomic Power Division have constructed an in-pile loop capable of sustaining fuel element temperatures and heat output conditions which approximate and even exceed actual reactor operating conditions. Stainless steel had been used for such loops. However, since increased neutron efficiency was desired, consideration was given to materials with lower neutron cross sections. A zirconium alloy (Zircaloy-2) was selected as an alternate material because, in addition to low thermal-neutron absorption, it has excellent corrosion resistance to high temperature water.

After Richard M. Lieberman, Associate Engineer in the Loop Design and Operation Group, designed the tube, James G. Goodwin, Senior Engineer in the Special Materials Section, directed a program to develop the proper process for fabricating the apparatus which was to be capable of withstanding 2500 psi internal pressure at 650°F. The vessel, constructed from a tubular extrusion (4.520 in. OD x 3.136 in. ID x 22 ft ⅜ in. long) was one of the largest single items ever manufactured from Zircaloy-2 and involved problems in four major areas: extrusion, machining, welding, and corrosion resistance.

Several problems were anticipated in extruding the tube. First, the severe galling tendency of Zircaloy created lubrication problems particularly on the tube ID. The long extrusion billet and the relatively small ID of the tube introduced problems concerned with the strength of a long, thin mandrel under the severe tensile forces of extrusion. Because of the small amount of metal cleanup allowed for the ID due to mandrel diameter limitations, good concentricity of the extruded tube was mandatory.

In order to straighten the 22 ft tube for accurate and precise machining, cold deflections of up to 7 in. were required.

The problem of producing sound welds included the need for complete penetration at the weld joints and rotation of the massive unit at a uniform speed during filler metal additions. Since contamination with air during welding would have produced brittle and corrodible welds, the tube had to be welded in an inert atmosphere.

Closeup of closure for Zircaloy in-pile tube.

To insure corrosion resistance of the finished tube, a layer of disturbed metal formed on the Zircaloy during machining had to be removed by etching. The configuration of the tube created difficulties in maintaining dimensional tolerances during the process and in removing all traces of corrosive acid.

The completed tube was installed in March, 1957 and has been operating continually in a large test reactor. During this development project, close technical cooperation was maintained throughout by Bettis and the test reactor personnel on design, fabrication and evaluation of the tube.

This is only one example of the challenging work conducted here. We welcome inquiries from metallurgists interested in the excellent careers offered by the new and growing nuclear power industry. Please send your résumé to: Mr. M. J. Downey, Bettis Atomic Power Division, Westinghouse Electric Corporation, P.O. Box 1468, Department A209, Pittsburgh 30, Pennsylvania.

BETTIS ATOMIC POWER DIVISION

Westinghouse

Larrabee. *Paint and Varnish Production,* v. 47, Aug. 1957, p. 35-37, 89.

New approach to applying protective coating on sheet steel prior to fabrication reduces deterioration. 6 ref. (L26n; ST, 4-3)

526-L. Study of Cadmium-Tin and Zinc-Tin Alloy Electrodeposits. Bennie Cohen. *Plating,* v. 44, Sept. 1957, p. 963-968.

Alloy electrodeposits provide superior coatings to either zinc or cadmium deposits. Procedures for plating S.A.E. 1020 steel with cadmium-tin and zinc-tin electrodeposits; electroplated steel specimens evaluated by salt spray and acid tests. 7 ref. (L17, *Cd, Sn, Zn,* ST)

527-L. Spectrophotometric Determination of Nickel in Bright Cadmium and Bright Gold Plating Solutions. Norman F. Doherty. *Plating,* v. 44, Sept. 1957, p. 971-974.

New Spectronic 20 colorimeter at the Cannon Electric Co., Los Angeles, maintains correct brightener content in the manufacture of plugs and connectors.
(L17, S11k; Ni, Cd, Au)

528-L. Electrochemistry and the Plater. Pt. 1. Fred G. Brune. *Products Finishing,* v. 21, Aug. 1957, p. 44-48.

Elementary electrochemistry of interest to the electroplater. (L17)

529-L. Some Problems of the Production of Sheet-Metal Components in Relation to Surface Quality and Finishing Processes. D. H. Lloyd. *Sheet Metal Industries,* v. 34, Aug. 1957, p. 577-584.

Effects on finishing processes of large grain size, stretcher strains, galling, badly designed folded joints, poor lubrication of press tools.
(L general, G general, 17-2; 4-3)

530-L. Barrel Finishing Made Simpler. Philip Kaftol. *Steel,* v. 141, Sept. 9, 1957, p. 108-109.

Chart indicating metal and nature of operation to be performed and requisite tumbling media, compound, concentration of compound and desired water level. (L10d)

531-L. Tin Bronze Alloys as a Decorative Plating. *Tin,* May 1957, p. 103-104.

Use of tin-copper alloys containing 7 to 20% tin as a corrosion resistant and decorative electroplate has achieved considerable popularity.
(L17, 17-7; *Sn, Cu,* 8-12)

532-L. Stress-Free Plating Salvages Valuable Jet Engine Parts. Edward Calderon. *Western Metals,* v. 15, Aug. 1957, p. 58-59.

Metal build-up to bring undersized production parts or worn out machine tools up to correct size was obtained by stress-free, high-tensile nickel deposits from a nickel sulphamate bath. (L17; Ni)

533-L. (French.) **Five Years of Observations on "Sulfinuzation".** Y. de Villemeur. *Metaux-Corrosion-Industries,* v. 32, June 1957, p. 249-259.

"Sulf-Inuz" process (treatment in hot bath at 570° C. designed to incorporate sulphur in surface area of metal, in presence of melted cyanide) greatly improves friction characteristics without need for prior machining to obtain perfect regularity of geometrical surfaces in contact. Analysis of interesting structures which explain the unusual properties conferred by this treatment on metal surfaces. (L15; *S*)

534-L. (French.) **Experimentation With Small-Scale Models of Continuous Installations for Electrolytic Treatment of Surface of Sheet Steel.** Louis Ferrand. *Societe des Ingenieurs Civils de France, Memoires,* v. 110, Mar-Apr. 1957, p. 85-108.

Equipment described; results of experiments with nickel, chromium, zinc and application of results to actual production. Suggests use of scale models for research purposes in other metallurgical areas. 29 ref. (L17, 1-2, 17-6; ST, *Ni, Cr, Zn*)

535-L. (Italian.) **Influence of Manganese on Plating Alloys for Use on Ergalplat 55 and 65.** A. Prati, A. Gragnani and D. Gualandi. *Allumimio,* v. 26, July-Aug. 1957, p. 301-314.

Experimental results showed that a 1% Zn, 1% Mn aluminum alloy gives better results than a 1% Zn alloy for plating Ergal-type alloys. Addition of manganese increases hardness of coating, retards diffusion of the alloying elements from core, and improves corrosion resistance of plated alloy. 8 ref.
(L17; 2-10; Al, *Mn*)

536-L. (Italian.) **Sherardizing: Influence of Part Shape on Depth of Sherardized Coatings and on Their Corrosion Resistance.** L. Matteoli and F. Barigozzi. *Metallurgia Italiana,* v. 49, May 1957, p. 355-362.

Conditions were defined experimentally for obtaining coatings of adequate thickness and protective power in cases of hollow and tubular parts, especially where cavities or recesses impede circulation and there is danger that mixture will sinter. Accelerated corrosion tests were made on treated samples. 14 ref. (L16, R11; *Zn*)

Metallography

Constitution and Primary Structures

283-M. Crystal Structures of Transition Metal Silicides. Carol H. Dauben. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 521-523.

Tables listing phases reported; ideal structure type; lattice constants; parameters of one type. 34 ref. (M26r; Si)

284-M. Structure Variation of Ingot Moulds in Use. *Foundry Trade Journal,* v. 103, July 4, 1957, p. 17-18.

Note on microstructure of ingot mold before and after use, describing ferrite and pearlite distributions. 5 ref. (M27d, W19c; ST)

285-M. Formation of Kink Bands During the Compression of Polycrystalline 70:30 Brass. M. Hatherly and L. E. Samuels. *Institute of Metals, Journal,* v. 85, June 1957, p. 437-440.

Investigates deformation band found in polycrystalline brass containing 30% zinc after small strains were introduced by rapid compression; considers nature and conditions associated with development of these kink bands and bands of secondary slip. 25 ref. (M26c, Q24a; Cu-n)

286-M. Bonding in Metals. Roland Kiessling. *Metallurgical Reviews,* v. 2, 1957, p. 77-107.

Discussion of physicist's and crystallographer's viewpoint of bonding. Several theories represent bonding in metals as similar to covalent bond. Need for further research on study of localized covalency of bonding. "Expanded" metallic structures may be means of studying metallic bonding. 64 ref. (M26)

287-M. Metallographic View. Pt. 36. High Speed Steels—Properties After Tempering. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, July 1957, p. 380-381, 403.

Hardness and microstructure of M-2 type high speed steel specimens after being air cooled from temperatures in the range of 2200 to 2250° F. and double tempered at 1025° F. (To be continued.)
(M27, Q29a, J29; TS-m)

288-M. Classification of Stringers and Identification of Inclusions in Reactor-Grade Uranium. H. A. Saller. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-965, Nov. 27, 1954, 21 p.

Characterization and identification of the inclusions comprising stringers in reactor-grade uranium.
(M28; U, 9-19)

289-M. Fundamental Considerations. Earl R. Parker. Lecture No. 2 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 1-27.

Effects of lattice imperfections, solute atoms and presence of a second phase. 29 ref. (M26, 3-19)

290-M. Impurities in the Common Nonferrous Metals. F. N. Rhines. Lecture No. 2 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 28-70.

Effects of impurities in solid solution and as second phases in aluminum, magnesium, copper and nickel. 14 ref.
(M27b, 3-19; Al, Mg, Cu, Ni, 9-1)

291-M. Phase Diagram of Titanium-Iron System. I. I. Kornilov and N. G. Boriskina. *Doklady Akademii Nauk SSSR,* v. 108, Nov. 6, 1956, p. 1083-1085. (*Henry Brutcher Translation* no. 3961.)

Based on thermal, dilatometric, micrographic and X-ray analyses, also on hardness and microhardness measurements. Experimental procedure and results; Ti-Fe phase diagram constructed on basis of results; solubility limit of titanium in alpha iron as function of temperature and in relation to susceptibility of alloys to aging. (M24b; Ti, Fe)

292-M. (German.) **Contribution to the Knowledge of the Partial Systems UC-TiC, -ZrC, -VC, -NbC, -TaC, -Cr_3C_2, -Mo_2C, and -WC.** H. Nowotny, R. Kieffer, F. Benesovsky and E. Laube. *Monatshefte für Chemie,* v. 88, June 15, 1957, p. 336-343. (CMA)

Study of the formation of solid solutions in systems composed of uranium monocarbide and carbides of metals of the fourth, fifth and sixth groups of the periodic table. The work was motivated by the recent proposals to use UC in the construction of nuclear reactors. It was expected that the introduction of a high-melting component would serve as a stabilizer. 6 ref. (M24d; U)

293-M. (Russian.) **Effect of Structure of Hard Titanium Alloy Tool Tips on Their Work Life.** P. K. Mikhailova. *Stanki i Instrument,* v. 28, June 1957, p. 26-27. (CMA)

The life of a titanium-tungsten hard tip depends on the structure of the grains of TiC, and on the relative sizes of the grains of TiC and WC. TiC grains may be made either of a single phase, or of two phases of which one is surrounded ringwise by the other. Such two-phase grains are considerably less

resistant to wear than the single-phase ones. (M26r, T6n, 17-7; Ti, 6-19)

294-M. (Russian.) **Rate of Transformation of a Solid Solution Into Sigma Phase in the System Fe-Cr-V.** I. I. Kornilov and N. M. Matveeva. *Zhurnal Neorganicheskoi Khimii,* v. 2, June 1957, p. 1383-1391. (CMA)

The system Fe-Cr-V was used for testing the method of rates of transformations as a means for establishing phase diagrams of alloys. Complete agreement in the results obtained by this and by other methods was observed. Rates of formation of compounds FeCr and FeV at 700° C. are 350 and 11 hr., respectively. Rates of formation of sigma solid solutions depend on the composition of the alloys. The rate is higher in alloys whose composition approaches FeV than in alloys approaching FeCr. 11 ref. (M24d, N6p, 3-17; Fe, Cr, V)

295-M **Methods of Studying the Primary Structure of Welds.** A. A. Rossoshinskii. *Avtomaticheskaya Svarka,* v. 8, no. 4, 1955, p. 90-94. (*Henry Brutcher Translation* no. 3992.)

A simple and reliable double-etch technique for revealing the primary structure of welds in low-carbon and low-alloy steels made by any welding process; examples of usefulness of method; upset welds in 0.06% C boiler plate steel; weld metal containing 2% Ni; primary structure of a 3% Ni steel weld compared with secondary structure. (M27d, M20q; ST, AY, 7-1)

296-M. (English.) **New Tools Reveal Microscopic Secrets of Nature.** Vern W. Palen. *Engenharia, Mineracao e Metalurgia,* v. 25, Mar. 1957, p. 149-151.

Description of Philips electron microscope designed to permit quick change-over from electron microscopy to diffraction. Specimen preparation, operating procedures. Solves problems of particle identification, structure, surface and physical characteristics, dispersion and molecular weights. (M21e, 1-3)

297-M. (French.) **Identification and Study of the "Light Phenomenon" in Structural Hardening Ni-Cr and Ni-Cr-Co Alloys.** Charlotte Bückle and Jean-Pierre Poulignier. *Comptes Rendus,* v. 244, May 6, 1957, p. 2385-2388.

Speed of hardening is the factor determining appearance of "light phenomenon", which can also develop during a tempering operation. Crystal structure of "light zones" is shown by micrography. (M27, J26, J29; Ni, Cr)

298-M. (German.) **Ternary System Titanium-Vanadium-Tin.** W. Koster and K. Haug. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 327-330. (CMA)

The phase diagram of the α system Ti-V-Sn was plotted for temperatures up to 1100° C. and tin contents up to 50%. The region along the Ti-V face of the prism, up to 10-20% Sn, is almost wholly occupied by the single phase of β solid solutions, while farther toward the Sn corner there are a two-phase region $\beta + Ti_3Sn$ and a three-phase region $\beta + Ti_3Sn + V_3Sn$. Near the titanium corner there occurs the transformation $\beta \rightarrow \alpha$. The solid solutions have a body-centered cubic structure. 8 ref. (M24c; Ti, V, Sn)

299-M. (German.) **The Ternary System Titanium-Silver-Aluminum.** W. Koster and A. Sampaio. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 331-334. (CMA)

A generalized phase diagram was constructed using metallographic and X-ray observations. As a general feature of the ternary diagram, the crystal phases belonging to the binary system Ti-Al are in equilibrium, first with the silver-rich melts, then, after solidification, with silver and silver-rich solid phases composing the binary system Ag-Al. 12 ref. (M24c; Ti, Ag, Al)

300-M. (German.) **Recrystallization Texture of Hafnium.** D. E. Eppelsheimer and D. S. Gould. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 349-351. (CMA)

Samples of hafnium containing 3% Zr were cold rolled to 95% of the original thickness and annealed at 800° C., after which the recrystallization texture of the material was measured goniometrically. It is a (0001) [1120] texture rotated 5-8° about an axis coinciding with the direction of rolling. This pattern is similiar to the recrystallization textures of zirconium and titanium. Hardness tests showed that hafnium is notably harder than zirconium and the hardening effect is more readily exhibited by hafnium than by zirconium. 10 ref. (M26c, N5; Hf)

301-M. (Italian.) **Origin of Characteristic Inclusions in Chromium Steel.** Raffaello Zoja. *Ricerca Scientifica,* v. 27, Jan. 1957, p. 119-122.

Complete picture of characteristic bi-phase inclusions and of the large number of inclusions derivable from same, for chromium steel with medium carbon and silicon content. Biphase inclusions originate from decomposition of a type of homogeneous inclusion. (M28; AY, *Cr*, 9-19)

302-M. (Japanese.) **Microscopic Examination of Steel-Sand Interface.** Tadao Sato and Tomoji Yoshikawa. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 439-446.

The observed structure of reaction products formed at high temperature at the interface of steel and sand molds; the relationship between steel structure and the adherence classified by three types: (1) slag infiltrating and adhering to the surface; (2) slag barrier surrounded by molten steel; and (3) penetration type. 5 ref. (M27; ST, NM-f45)

303-M. (Russian.) **Nonmetallic Inclusions in Nodular Cast Iron.** P. P. Arsentyev and Yu. Ya. Orlova. *Liteinoe Proizvodstvo,* v. 34, Apr. 1954, p. 23-24.

Cast iron samples were analyzed by electrolytic and petrographic means before and after addition of magnesium, and separately, ferrosilicate. Nonmetallic inclusions were found to be made up of SiO_2 in the form of yellowish grains, $3CaAl_2O_3$ in colorless clusters, $MgOAl_2O_3$ in form of colorless octohedral crystals and siliceous glass. Magnesium exceeded by several times the nonmetallic inclusions. (M27, M23; CI-r, 9-19)

304-M. **The Binary System Sodium-Lithium.** W. H. Howland and L. F. Epstein. Paper from "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 34-41.

The sodium-lithium phase system has been studied by thermal analysis in the liquid and solid regions to temperatures in excess of 400° C. Correlation of the experimentally observed data with the Scatchard-Hildebrand regular solution model using the Flory-Huggins entropy correction is discussed. 10 ref. (M24b, P12; Na, Li, 14-10)

305-M. **Electron Microstructure of Some Quenched and Tempered, Low-Alloy, Medium-Carbon Steels.** R. P. Sernka and S. T. Ross. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 398-408.

Electron micrographs show that percarbide films outline martensite needles tempered for 1 hr. or more in the 200 to 350° F. range; above 450° F., these films are supplanted by elongated and discontinuous cementite particles; no martensite subgrain network was found in electron micrographs of the samples; no microstructural differences were detected in electron micrographs of various steels tempered under the same conditions of time and temperature. 11 ref. (M21e, M27d; AY)

306-M. **Method for Making Positive Replicas and the Preparation of Steel Specimen for Electron Microscopy.** J. B. Le Poole and F. Van Wijk. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 409-414.

Technique for preparing negative silver and positive carbon replicas. 3 ref. (M20r, M21e; ST)

307-M. **Electropolishing of Ferrous Metal Specimens for Electron Metallography.** F. W. Boswell. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 426-435.

An investigation of the various electrolytes that have been recommended for ferrous specimens excepting those solutions involving perchloric acid which were considered somewhat hazardous for general laboratory use. (M20p, M21e; Fe, ST)

308-M. **Comparison of Surface and Volume Transformations in Alloy Steel.** L. S. Birks and R. T. Seal. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 436-443.

In the bainite region, it appears that results from high-temperature X-ray diffraction and from thermal emission electron microscopy (both of which utilize the free surface of a specimen) can be interpreted without error. (M21e, M22g, N8m; AY)

309-M. **Chemical Polishing of Steel for Electron Metallography.** Ronald L. Scott. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 444-457.

Interpretation of electron micrographs of steel polished by both mechanical and chemical methods is similar in most cases. 10 ref. (M20p, M21e; ST)

310-M. **Electron Microscopic Identification of the Gamma' Phase of Nickel-Base Alloys.** W. C. Bigelow, J. A. Amy and L. O. Brockway. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 945-953.

Electrolytic etching for short periods in a reagent consisting of 5 ml. hydrofluoric acid (48%), 10 ml. glycerol, 10 to 50 ml. ethyl alcohol, and water to make 100 ml. total volume, produces a preferential attack on the particles of the intermetallic gamma' phase of nickel-base alloys containing titanium and aluminum. 9 ref. (M21e, M20q; Ni, *Ti, Al*)

311-M. Crystal Structures of Transition Metal Silicides. C. H. Dauben. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 521-523. (CMA)

A table indicating structure types among transition metal silicides lists disilicides of titanium, zirconium, vanadium and molybdenum, Ti_5Si_3, Zr_5Si_3, TiSi, ZrSi, V_5Si_3, Mo_5Si_3, Ti_5Si_3, Zr_5Si_3, Zr_2Si, Zr_3Si_2, V_3Si and $MoSi_3$. V_2Si does not exist and Mo_3Si_2 does not exist in hexagonal form. Lattice constants and crystal forms are tabulated. 34 ref. (M26r; Ti, Zr, V, Mo, *Si*)

312-M. Domain Wall Orientations in Silicon-Iron Crystals. C. D. Graham, Jr., and P. W. Neurath. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 888-891.

Experimental confirmation of calculations of energy of domain wall as a function of crystallographic orientation. In unstressed crystals with a (100) plane parallel to the surface, the 180° domain walls do not lie perpendicular to the surface but are inclined at a relatively large angle. An applied stress can greatly influence domain wall orientation. 8 ref. (M27g, M26; Fe, *Si*)

313-M. An Investigation of the Zirconium-Tantalum System. V. S. Emelyanov, Y. G. Godin and A. I. Evstyukhin. *Journal of Nuclear Energy,* v. 5, Pt. 2. *Soviet Journal of Atomic Energy,* v. 2, no. 1, 1957, p. 247-252. (CMA)

The Zr-Ta system was studied by X-ray diffraction, hardness measurements, thermal analysis, metallography and electrical resistance. The phase diagram is of the eutectic type. Alpha-Zr dissolves 0.22 at. % Ta and beta-Zr 16 at. % Ta at 1585° C. At 1585° C. tantalum dissolves 17 at. % Zr. The eutectic occurs at 1585° C. and 34 at. % Ta. The beta-Zr solid solution transforms eutectoidally at 790° C. and 7 at. % Ta. (M24b; Zr, Ta)

314-M. Sub-Microscopic Structure of "Ticonal" G Magnet Steel. H. B. Haanstra, J. J. de Jong and J. M. G. Smeets. *Philips Technical Review,* v. 19, no. 1, p. 11-14.

Structure of a single crystal of Alnico V. 4 ref. (M26; SGA-n, 14-11)

315-M. Metallographic Quality Studies of Thorium Metal. S. J. Broderick and A. J. Busch. New Brunswick Laboratory, *U. S. Atomic Energy Commission,* NBL-135, Apr. 1957, 39 p.

Thorium metal, as-cast, arc-melted ingots and rolled wrought metal has been examined microscopically for inclusion and stringer concentration. Tentative rating methods for metal quality have been proposed based on the number and diameter of the inclusion clusters in cast metal. 8 ref. (M27; Th, 9-19)

316-M. (English.) **Note on Preferred Orientations in Uranium as Determined by Dilatometric Studies.** Steinar Aas. *Tidsskrift for Kjemi, Bergvesen Og Metallurgi,* v. 17, no. 5, 1957, p. 77-80.

Uranium metal was reduced 80% by rolling. The thermal dilations of the finished plates were determined and correlated with theoretical dilations, calculated by assuming various types and degrees of preferred orientations. The results confirm that a (010)—(110) double texture develops at rolling temperatures just below the recrystallization point. 12 ref. (M26c; U)

317-M. (French.) **New Method of Preparation of Thin Metal Films for Electron Microscopy.** N. Takahashi, K. Kazato, K. Ashinuma and M. Watanabe. *Bulletin de Microscopie Appliquée,* v. 7, Apr. 1957 p. 29-33.

Diffraction diagram and microscopic image of selected region of object under study obtained simultaneously. Examples of use on Pb-Sn, Al-Ag, Al-Zn, Cu-Al alloys and others. (M20, M21e)

318-M. (French.) **Study of the Elimination of Voids in High-Purity Aluminum.** Michel Wintenberger. *Comptes Rendus,* v. 244, June 3, 1957, p. 2800-2803.

Mechanism of elimination of excess voids; determination of density of dislocations induced in pure aluminum by plastic deformation. (M26s, M26b; Al)

319-M. (French.) **Resorption of Voids of Ferrous Oxide During Oxidation of Iron at High Temperature.** Michel Cagnet and Jean Moreau. *Comptes Rendus,* v. 244, June 12, 1957, p. 2925-2927.

Study of what happens to flux of voids entering Fe-FeO interface zone. 5 ref. (M26s, R1h; Fe)

320-M. (French.) **Theoretical Data on the Properties of Uranium.** A. Guinier. *Metaux-Corrosion-Industries,* v. 32, June 1957, p. 225-234.

Structure of uranium atom and crystal, thermal dilation, plastic deformation, effects of fission, action of uranium on other elements. 10 ref. (M25, M26, P11, Q general, 2-17; U)

321-M. (French.) **Film Mounts and Printing Techniques in Electron Microscopy. (Concluded.)** Roger Dargent. *Metaux-Corrosion-Industries,* v. 22, June 1957, p. 235-248.

Evaporation procedures, including preparation of films, shadow techniques, shadows on aluminum prints; cathodic atomizing as a metallographic etch method, including description of equipment used. 82 ref. (M21e, 1-3)

322-M. (French.) **Application of Electron Micrography to the Study of Crystal Surfaces and Intergranular Boundaries in Aluminum.** Pierre Bussy. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 325, 1957, 72 p.

Surfaces of electrolytically polished aluminum crystals presented varying appearances, depending on their orientation in relation to the lattice. Etching appeared to be produced by formation of submicroscopic faces parallel to planes (001). New experiments in intergranular corrosion of aluminum in hydrochloric acid indicated that homogenization of impurities and their diffusion to grain boundaries modifies kinetics of the etching process and appearance of specimens. Iron impurity presented different behavior, leading to a reverse type of etching called honeycomb. (M27f, M26, M21e, M20q; Al)

323-M. (French.) **Contribution to the Study of the Properties and Modes of Decomposition of the Protoxide Phase of Iron.** Robert Collongues. *Ministere de l'Air Publications Scientifiques et Techniques,* Paris, no. 324, 1957, 82 p.

Study by means of micrography and monochromatic X-ray diffraction. Ferrous oxide was formed by oxidizing iron in different mixtures of hydrogen and water vapor: influence of minimum traces of impurities on metal-oxide interface was studied, existence of substructure of protoxide of iron crystals discovered. Study of decomposition of ferrous oxide in iron and magnetite revealed existence of structures of products of decomposition quite similar to structures formed during austenitic decomposition. Structure of new phase formed by transformation of ferrous oxide phase at low temperature was determined. Study made it possible to consider ferrous oxide as a true solid solution with 570° C. eutectoid point. 70 ref. (M26r, M27a; Fe)

324-M. (German.) **Carbides in Ferrous Alloys With High Chromium and Carbon Content.** H. Tuma, K. Löbl and J. Jezek. *Neue Hütte,* v. 2, June 1957, p. 362-366.

Carbides in Fe-Cr-C alloys; changes in the composition and structure of carbides during holding at elevated temperatures. 8 ref. (M26r, 2-12; Fe, Cr, C)

325-M. (Italian.) **Structure and Plastic Deformation of Mild Steel Sheet.** Giuseppi Chiuppani. *Rivista di Meccanica,* no. 158, Mar. 1957, p. 41-49.

Grain size and its influence on deep drawing characteristics of mild steel; crystal network and changes brought about by plastic deformation. 8 ref. (M27c, Q24; CN, 4-3)

326-M. (Japanese.) **Microscopic Examination of Steel-Sand Interface.** Tadas Sato and Tomoji Yoshikawa. *Journal of Railway Engineering Research,* v. 14, June 15, 1957, p. 25-31.

Experimental methods; penetration mechanism of molten steel into sand. 5 ref. (M27, D9k; ST, 5-9)

327-M. (Book.) **Cobalt and Its Alloys. A Summary on Allotropy and Phase Diagrams.** 107 p. 1957. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Collection of literature references and phase diagrams. Intermetallic compounds are indicated by their nearest chemical formula, and structure is shown. (M24, N6p; Co)

N

Transformations and Resulting Structures

291-N. Aging Characteristics of Ternary Aluminium-Zinc-Magnesium Alloys. I. J. Polmear. *Department of Supply, Research & Development Branch, Aeronautical Research Laboratories,* ARL/MET 20, Jan. 1957, 39 p.

Hardness-aging time curves for temperatures between −20 and 240° C. of alloys containing 4, 6 and 8% zinc and 0 to 3% magnesium. Results showed two stages in aging processes which were concluded to be Guinier-Preston zones and an intermediate precipitate. However, equilibrium phase or phases may not have been detected and there may be three phases involved. 36 ref. (N7a; Al, *Zn, Mg*)

292-N. Solid-Solution Hardening of Aluminum and Magnesium. D. Hardie and R. N. Parkins. *Institute of Metals, Journal,* v. 85, June 1957, p. 449-455.

Hardness test and lattice parameter measurement conducted on

aluminum and magnesium solid solutions. Materials alloyed with aluminum included copper, germanium, magnesium, silver, zinc or silicon; solutes dissolved in magnesium were aluminum, bismuth, cadmium, indium, lead, lithium, silver, tin or zinc; established relationship between lattice distortion and hardening and between extent of hardening and solute concentration.
(N12p, N7, Q29; Al, Mg)

293-N. Mechanical Properties Versus Microstructure. J. B. Malerich and G. V. Cash. *Metal Progress,* v. 72, Aug. 1957, p. 106-111.

Tempered martensite is the best microstructure for low-alloy Cr-Mo-V steel if impact strength and ductility (in tensile and stress-rupture tests) are desired; fine bainite is best if short-time tensile and stress-rupture strength is desired; coarse bainite has best creep strength at 900 and 1000° F. (N8m, N8p, Q27a, Q3m, Q6n; AY, *Cr, Mo, V*)

294-N. Transformation of Austenite to Bainite. L. M. Pevsner, T. D. Kubyshkina, G. M. Rovenskii and A. I. Samoilov. *Metal Progress,* v. 72, August 1957, p. 150-151. (Digest from *Metallovedenie i Obrabotka Metallov,* no. 10, 1956, p. 2-20.)

Previously abstracted from original. See item 30-N, 1957. (N8m; ST)

295-N. Application of Radioactive Tracers to the Study of Transgranular and Grain-Boundary Diffusion. C. Leymonie and P. Lacombe. *Metaux,* no. 358, 1955, p. 231-242. (*Henry Brutcher Translation* no. 3782.)

Previously abstracted from original. See item 330-N, 1956. (N1, S19)

296-N. Theory and Calculation of Induction of Elastic Oscillations in Molten Metal. I. I. Teumin. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 50-69. (*Henry Brutcher Translation* no. 3930.)

Effect of mechanical oscillation on the crystallization of metals and the potentialities of their practical application, with special reference to the induction of elastic waves in the ultrasonic range directly in liquid metal. Methods of inducing elastic oscillations in metal melts; traveling-wave conditions; standing-wave conditions.
(N12, 1-24, Q21f; 14-10)

297-N. Kinetics of Growth of the Diffusional Layer in the Boronizing of Steel. V. D. Taran and L. P. Skugorova. *Fizika Metallov i Metallovedenie,* v. 3, No. 1, 1956, p. 66-69. *(Henry Brutcher Translation no.* 3976.)

Previously abstracted from original. See item 534-N, 1956. (N1; Ay)

298-N. Study of Some Relationships in the Formation of Alloys of Isomorphic Borides. G. V. Samsonov and V. S. Neshpor. *Zhurnal Fizicheskoi Khimii,* v. 29, No. 5, May 1955, p. 839-845. *(Henry Brutcher Translation* no. 3997.)

Investigation of some physicochemical properties of alloys of the system TiB_2-CbB_2—isomorphic borides of Group IV and V metals and of processes of mutual diffusion leading to the formation of alloys of titanium and columbium borides; experimental procedure involving the heating of powder mixes for various times and at various temperatures, followed by an X-ray study.
(N1, H general; Ti, Cb, *B,* 14-18)

299-N. (Hungarian.) **Effect of Traces of Impurities on the Secondary Recrystallization of Tungsten Wires.** T. Millner, J. Prohaszka and A. Horvath. *Acta Technica,* v. 17, no. 3-4, 1957, p. 289-304.

The crystal growth during recrystallization of processed tungsten wires having a fibrous structure has been observed by means of the Robinson method. Investigations were carried out at temperatures ranging from 2000-2300° K. on GK wires, containing K, Si and Al atoms in approximately 10^{-5} num. concentration (and UC wires) containing only K and Si atoms in approximately 10^{-5} num. concentration. (N5h, 3-9; W, 4-11)

300-N. (Russian.) **Recrystallization Diagram of Molybdenum.** E. M. Savitskii, V. V. Baron and K. N. Ivanova. *Akademiya Nauk S.S.S.R. Doklady,* v. 113, Apr. 11, 1957, p. 1070-1072. (CMA)

Plasticity of fine-grained molybdenum is much higher than that of coarse-grained. The desired uniform fine-grained structure is obtained by an appropriate combination of mechanical deformation and thermal treatment. The authors investigated these relationships systematically and constructed a diagram of recrystallization occurring in fine-grained molybdenum after it has been submitted to cold compression followed by annealing. 4 ref.
(N5f, M27c; Mo)

301-N. Quantitative Theory of Grain Boundary Movement and Recrystallization in Metals in the Presence of Impurities. K. Lucke and K. Detert. Brown University. (Air Force Office of Scientific Research.) *U. S. Office of Technical Services,* PB 121484, Apr. 1956, 32 p. $1.

The quantitative atomistic theory discussed rests on the assumption that interaction forces exist between the foreign atoms in solid solution and the boundary, increasing the atoms in the boundary. At high concentrations (or low temperatures) the moving boundaries are held back by the foreign atoms and the speed of the boundary is controlled by the speed of the foreign atoms diffusing beyond the boundary. At low concentrations (or high temperatures) the boundary cannot be held by the foreign atoms; breakaway occurs and the boundary moves much faster. (N3, N5, 3-19)

302-N. Grain Growth of Titanium and Titanium Alloys at Normal Hot Working Temperatures. F. R. Larson. Watertown Arsenal Laboratory, Report 401/244. *U. S. Office of Technical Services, PB 131115.* Aug. 1955, 28 p. (CMA)

Rem-Cru grades 55, 70, 130A and 130B of titanium were studied to determine grain growth at normal hot working temperatures. The alpha-beta duplex structure has one rate of grain growth and the all-beta structure another. (N3; Ti)

303-N. Tempering Phenomena in Martensite. W. Jellinghaus. *Archiv für das Eisenhüttenwesen,* v. 27, no. 7, 1956, p. 433-448. (*Henry Brutcher Translation* nos. 3876, 3928.)

Previously abstracted from original. See item 417-N, 1956.
(N8, J23, CN)

304-N. (French.) **Orientation Superstructures in Iron-Nickel Alloys.** Eric Tapley Furguson. *Comptes Rendus,* v. 244, May 6, 1957, p. 2363-2366.

Uniaxial anisotropy induced by annealing in a magnetic field was determined in relation to composition of the alloy, temperature and duration of annealing process. 7 ref.
(N5g, J23; Fe, Ni, SGA-n)

305-N. (French.) **Decomposition of Austenite Into Alpha Phase Under Effect of Latent Strains in 18-8 Type Stainless Steels.** Paul Bastien and Gilbert Stora. *Comptes Rendus,* v. 244, May 20, 1957, p. 2613-2616.

In unstable austenites an alpha phase can appear as a result of latent strains due to cooling, or to modifications of the equilibrium of these strains by controlled dissolution. Alpha phase needles develop at a rate that can be measured perfectly by cinematography.
(N8; SS)

306-N. (German.) **Action of Liquid Zinc on Titanium.** K. Ruttewit and E. Eichmeyer. *Metall,* v. 11, Aug. 1957, p. 659-662. (CMA)

The intense dissolving action of liquid zinc on titanium was revealed in experiments with sheet and rod samples of titanium held for various lengths of time in liquid zinc at various temperatures. While the time dependence follows an approximately linear law, the effect of temperature, which is considerable almost from the melting point of zinc (419° C.), increases very rapidly, so that at 600° C. samples of titanium are completely dissolved within a few hours. 10 ref.
(N12; Zn, Ti, 14-10)

307-N. (German.) **On the Hardening of Tooth Fillings and Resulting Transition Structures of Tin-Silver Amalgams.** Rudolf Vogel and Anita Bächstaedt. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 360-366.

The transition structures produced during the hardening of silver-tin amalgams at room temperature in times up to 10 weeks are investigated microscopically and interpreted in the phase diagram.
(N7a; Sn, Ag)

308-N. (Russian.) **Phase Transformations in Chromium-Molybdenum-Iron Alloys Which Are Rich in Chromium.** N. V. Ageen, L. N. Cuseva and K. P. Markovich. *Akademiya Nauk S.S.S.R. Izvestiya Otdelenie Tekhnicheskikh Nauk,* no. 4, Apr. 1957, p. 23-32. (CMA)

Chromium-molybdenum-iron combinations containing 60% chromium, which exhibit optimum refractory and mechanical properties, change their structure on cooling from 1200° C. from that of an alpha solid solution to one containing the sigma phase which impairs both the mechanical and anticorrosive properties of the material. Kinetics of the decomposition of the solid-solution phase in the temperature range 1050-750° C. were investigated.
(N6p; Cr, Mo, Fe)

309-N. (Russian.) **Mechanism of Effect of Low-Temperature Aging of White Cast Iron on Density of Graphitization After Subsequent Annealing.** G. I. Ivantzov. *Metallovedenie i Obratka Metallov,* no. 4, Apr. 1957, p. 9-16.

Experimental data indicate that in white cast iron not exposed to preliminary hardening by deformation, graphite is formed along the lines of demarcation between eutectic cementite and hard solution. 19 ref.
(N8s; CI-p)

310-N. Model for Solute Diffusion in Metals Based on Elasticity Concepts. R. A. Swalin. *Acta Metallurgica,* v. 5, Aug. 1957, p. 443-448.

In model solute ion is considered to behave as an elastic sphere. Theory is compared with solute diffusion activation energies measured experimentally in nickel and silver as solvents. 25 ref. (N1, Q21; Ni, Ag)

311-N. Growth of Voids in Metals During Diffusion and Creep. R. W. Balluffi and L. L. Seigle. *Acta Metallurgica,* v. 5, Aug. 1957, p. 449-454.

Postulation for void formation during creep. Roles of vacancy supersaturation and stress in producing voids. 22 ref. (N1, Q3, M26s)

312-N. Grain-Boundary Melting. F. Weinberg and E. Teghtsoonian. *Acta Metallurgica,* v. 5, Aug. 1957, p. 455-464.

Melting behavior of grain boundaries of bicrystal tin and bicrystal aluminum examined as a function of stress, heating rate, boundary angle and impurity concentration. 7 ref. (N12, M27f; Sn, Al)

313-N. Segregation at the Eutectic Temperature. B. C. Allen and S. Isserow. *Acta Metallurgica,* v. 5, Aug. 1957, p. 465-572.

Investigation in uranium-aluminum system of segregation effect. Effect can be amplified by repeated cycles involving alternate heating and cooling through the eutectic temperature. 7 ref.
(N12q; U, *Al,* 9-19)

314-N. Observations of Bainite Formation With the Thermionic Emission Microscope. Irwin I. Bessen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 415-425.

Growth of the bainite needles appears to occur by a diffusion mechanism at higher reaction temperatures. The axial growth is more rapid than the lateral growth and is directed in a definite plane. Growth may propagate to an adjacent grain of austenite after undergoing a change in direction. 3 ref. (N8m, M21e; ST)

315-N. X-Ray Study of Polygonization in Copper Single Crystals. C. T. Wei, M. N. Parthasarathi and P. A. Beck. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 874-877.

Bent single crystals of electrolytic tough pitch copper and 99.999% purity copper studied. Polygonization took place only upon prolonged annealing at around 97% of absolute melting point. (N5; Cu, 14-11)

316-N. Oxygen Content of Silicon Single Crystals. W. Kaiser and P. H. Keck. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 882-887.

Infrared absorption at 9 microns which is proportional to oxygen concentration in silicon was used to determine oxygen content in silicon samples of different origin and treatment. Silicon crystals pulled from a quartz crucible showed varying oxygen concentrations depending upon pulling parameters, temperature distribution in the melt and rotation rate. 22 ref. (N3r; Si, *O*)

317-N. Theory of Diffusion Constants in Interstitial Solid Solutions of b.c.c. Metals. A. Ferro. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 895-900.

Mechanism of interstitial diffusion and experimental confirmation, based on evaluation of activation energy, assumed to be equal to elastic strain energy necessary in thermal fluctuation to enlarge a cavity adjacent to an occupied one to the size of the interstitial atom. 25 ref. (N1, P13a; 14-17)

318-N. Making Better Steel Sheet: Metal Behavior During Cold Rolling and Aging. H. C. Rogers. *Journal of Metals,* v. 9, Aug. 1957, p. 1034-1039.

Modern theories of dislocation and strain-aging correlated with the effects of mechanical working. 59 ref. (N7e, F23; ST, 4-3)

319-N. Metal Whiskers. *Metal Industry,* v. 91, Aug. 2, 1957, p. 94.

Briefly reviews methods used in growing tin, zinc and cadmium metal whiskers and factors affecting growth, physical and mechanical properties of whiskers.
(N3r; Sn, Zn, Cd)

320-N. On the Thermodynamics and Kinetics of Recovery. Michael B. Bever. Paper from "Creep and Recovery", American Society for Metals, p. 14-51.

Thermodynamic characteristics of cold worked state. Summary of published information on stored energy of cold work. Observations on release of stored energy and role in recovery process. 59 ref. (N4, P12)

321-N. Polygonization. W. R. Hibbard, Jr., and C. G. Dunn. Paper from "Creep and Recovery", American Society for Metals, p. 52-78.

Process of polygonization based on metallographic observation of bent and annealed single crystals of silicon-iron. Evidence presented as basis for considering polygonization as distinct from recrystallization. 23 ref. (N4, N5, J23)

322-N. Discussion of Hibbard and Dunn Paper on Polygonization. John J. Gilman. Paper from "Creep and Recovery", American Society for Metals, p. 79-83.

Observations of dislocations in lithium fluoride crystals.
(N4, N5, M26b; Li)

323-N. Recovery of Mechanical Properties. E. C. Perryman. Paper from "Creep and Recovery", American Society for Metals, p. 111-145.

Recovery of plastically deformed single crystals and cold worked polycrystals; effects of alloying elements on the separate recovery and recrystallization processes; effects of recovery and recrystallization on creep; relationship between recovery substructures and mechanical properties. 84 ref. (N4, N5, Q3a, 2-10)

324-N. Recovery of Internal Friction and Elastic Constants. A. S. Nowick. Paper from "Creep and Recovery", American Society for Metals, p. 146-175.

Recovery of Young's modulus and damping of deformed metals; two theories are discussed: namely, point defects created by deformation pin dislocation segments to produce recovery; and dislocation rearrangement is responsible for recovery. 48 ref. (N4, Q21, Q22, M26b)

325-N. (French.) **Micrographic Study of the Growth of Crystals by Condensation of the Vapor Phase in the Case of Cadmium.** Andre Accary and Robert Franklin Mehl. *Comptes Rendus,* v. 244, May 27, 1957, p. 2713-2716.

For supersaturations between 0.5 and 1.1, surface parallel to plane (1000) of cadmium crystals produced by condensation presents patterns of concentric microscopic layers. These patterns, which are few, are possibly centered at points of emergence of dislocations. (N15g; Cd)

326-N. (French.) **Study of the Recrystallization of Aluminum Monocrystals After Plastic Deformation.** Jean Montuelle. *Comptes Rendus,* v. 244, June 12, 1957, p. 2923-2925.

It is possible to prepare aluminum monocrystals by critical cold working of single crystals, the amount of cold working varying greatly with crystal orientation. Recrystallized crystals thus obtained are more perfect than those from which they are derived. (N5; Al, 14-11)

327-N. (French.) **Influence of the Purity and the Structure of the Metal on Intergranular Diffusion of Oxygen in Iron.** Raymond Sifferlin and Claude Bourelier. *Comptes Rendus,* v. 244, June 12, 1957, p. 2928-2929.

Microscopic study of oxide inclusions in crystals of high-purity iron refined by zone melting process showed solubility of oxygen to be extremely low or nil.
(N15e, C28k; Fe, *O*)

328-N. (French.) **Study of the Kinetics of the Martensite Transformation and the Stabilization of Austenite.** C. Crussard and J. Philibert. *Institut de Recherches de la Sidérurgie, Publications,* Ser. A, no. 156, Feb. 1957, p. 1-8. (Reprinted from *Revue de Metallurgie,* v. 53, Dec. 1956, p. 973-980.)

In determining transformation of hypereutectoid chromium steels by measuring density and dilation, and of ferronickels by measuring resistivity, it was shown that stabilization of austenite requires simultaneous presence of two factors: a chemical agent and a physical cause. Carbon or nitrogen content strongly influences kinetics of transformation. It can be shown that isothermal and anisothermal transformations proceed from a single mechanism: thermally activated germination and athermal growth. 22 ref. (N8; AY)

329-N. (French.) **Action of Nitrogen on Nickel.** J. J. Trillat, L. Tertian, N. Terao and C. Lecomte. *Société Chimique de France, Bulletin,* no. 6, June 1957, p. 804-809.

Cubic face-centered lattice of nickel heated in current of ammonia gas is markedly dilated by introduction of nitrogen atoms into lattice. At about 175° C. dilated lattice is transformed into a hexagonal lattice, forming an Ni_3N compound. This compound, when heated under vacuum, gives ordinary nickel. Similar results are obtained by ionic bombardment of nickel by ions originating in air. These phenomena were studied by electron diffraction techniques which make possible continuous observation of the modifications which occur, as well as ionic bombardment of specimen inside the electronic instrument itself. 13 ref.
(N15e; Ni, *N*)

330-N. (German.) **Kinematics of Tin Crystal Growth.** E. Anastasiadis. *Neue Hütte,* v. 2, July 1957, p. 425-440.

Microcinematographic observation of the growth of electrolytically separated tin crystals; growth rhythm; deformation of growing crystal bodies; metamorphosis of dendrites to perfect crystal octahedrons; differential and selective activity of the growing crystal zones; determination relating to time and space of the growth phenomena. 40 ref.
(N12b, N12c; Sn)

331-N. (Italian.) **Structural Changes in Aluminum Alloys During Fatigue**

Tests. F. Gatto. *Alluminio,* v. 26, July-Aug. 1957, p. 315-317.

Results of rotary bending tests on notched specimens confirmed that fatigue behavior of Al-Cu-Mg type alloys is determined by precipitation of copper. 3 ref. (N7, Q7c; Al, *Cu*)

332-N. (Italian.) **Dialogue Between a Steelmaker and a Machinist. Segregation in Steel.** Aldo Bartocci. *Macchine,* v. 12, July 1957, p. 649-656.

Origin, development and influence of segregations explained to machinist in informal dialogue and semi-humorous vein. (N12; ST, 9-19)

333-N. (Russian.) **Study of the Decomposition of a Supersaturated Solid Solution of Nickel-Chromium-Titanium-Aluminum.** V. G. Chorny. *Akademiya Nauk U.S.S.R. Dopividi,* no. 4, 1957, p. 362-367. (CMA)

One sample was quenched, the other strained after quenching. Changes in microstress, dimensions of the coherent X-ray scattering area and crystal lattice constants were studied, as were the hardness and state of the intermetallic alloy phase precipitated out during decomposition. (N7b; Ni, *Cr, Ti, Al*)

Physical Properties

323-P. Investigation in Non-Aqeous Solvents. Pt. 2. Solubility and Conductances of Some Rare Earth Metal and Thorium Acetates in Ethylenediamine. T. Muniyappan and B. Aanjaneyalu. *Indian Academy of Sciences, Proceedings,* v. 45, no. 6A, June 1957, p. 412-417. (CMA)

Lanthanon acetate solubilities and conductances in anhydrous ethylenediamine studied as a preliminary to electro deposition studies at low temperature. Only cerous and lanthanum ions are soluble and conductances show the behavior of weak electrolytes. 11 ref. (P15g; EG-g, Th)

324-P. Effect of Quenching on Thermal Conductivity and Electrical Resistivity. R. W. Powell. *Iron and Steel,* v. 30, June 8, 1957, p. 283-285.

Electrical resistivities and thermal conductivity of oil quenched and water quenched steels. (P11h, P15g, 2-14, ST)

325-P. Effect of Oil Quenching and Tempering on Thermal Conductivity and Electrical Resistivity. R. W. Powell and R. P. Tye. *Iron and Steel,* v. 30, June 8, 1957, p. 285-288.

Thermal conductivity and electrical resistivity for a high-carbon, chromium-molybdenum steel and for an En8 and En19 steel. (P11h, P15g; 2-14; ST)

326-P. Low-Temperature Reactor Irradiation Effects in Metal. T. H. Blewitt, R. R. Coltman, C. E. Klabunde and T. S. Noggle. *Journal of Applied Physics,* v. 28, June 1957, p. 639-644.

Effects of structural and chemical defects on 30-50° K. annealing peak in aluminum and copper. It is suggested that a defect similar to a crowdion must be created by low-temperature neutron irradiation. Experiments also preclude vacancy-interstitial annihilation. (P18h, 2-17)

327-P. Magnetostriction of Aluminum-Iron Single Crystals in the Region of 6 to 30 Atomic Percent Aluminum. R. C. Hall. *Journal of Applied Physics,* v. 28, June 1957, p. 707-713.

Measurement and evaluation of spontaneous saturation magnetostriction and forced magnetostriction on slowly cooled single crystals of ferromagnetic aluminum-iron alloys. (P16b; Fe, *Al,* 14-11)

328-P. Resonance Absorption of Neutrons by Thorium Cylinders. Monte V. Davis. *Journal of Applied Physics,* v. 28, June 1957, p. 714-716.

Measurement of resonance integral and determination of Doppler coefficients. (P18m; Th)

329-P. High Conductivity Copper Alloys. *Metal Industry,* v. 90, June 21, 1957, p. 522 and 526.

Electrical conductivity, softening temperatures and mechanical properties of copper containing 0.25% zirconium. (P15g; Cu, *Zr*)

330-P. Mystery of Magnetic Annealing. J. J. Becker. *Metal Progress,* v. 72, Aug. 1957, p. 84-89.

Properties of some magnetic alloys are improved by annealing in a magnetic field. In age hardening alloys this may be due to growth of needle-like particles aligned by the magnetic field; in solid solutions "ordered" particles may grow in similar shapes, or atom-pairs may be aligned with the field. (P16, J23; SGA-n)

331-P. Superconducting Properties of Rhenium, Ruthenium and Osmium. J. K. Hulm and B. B. Goodman. *Physical Review,* v. 106, May 1957, p. 659-671.

Influence of various methods of specimen preparation and treatment on superconductivity. Results reinforce conclusions that behavior is a result of specimen preparation and not a fundamental property of the group. (P15g; Re, Ru, Os)

332-P. Electrical Resistivity of Au_3Cu at Low Temperatures. Hiroshi Sato. *Physical Review,* v. 106, May 1957, p. 674-675.

Temperature-resistivity curves from liquid helium temperature to room temperature were measured on quenched specimen as well as on specimens annealed for different lengths of time at 185° C. Debye temperature of ordered state was found to be lower than that of disordered state, which is contrary to results for Cu_3Au. 4 ref. (P15g, 2-13; Au, Cu)

333-P. Paramagnetic Effect in Superconductors. Pt. 4. Measurements on Aluminum. A. H. Fitch and Hans Meissner. *Physical Review,* v. 106, May 1957, p. 733-736.

By means of a cryostat, operating down to 0.9° K., paramagnetic effect of polycrystalline and single crystal pure aluminum was observed. Behavior of polycrystalline sample conformed with that observed in other superconductors; however, Ig value was below 0.6 amp., thereby indicating Ig values do not necessarily occur in multiples of 0.6 amp. as suggested from measurements of other superconductors. (P16p, P15g; Al)

334-P. Development of Dimensionally Stable Uranium Alloys. F. R. Shober, L. L. Marsh and G. T. Muehlenkamp. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-961, Oct. 26, 1954, 37 p.

Results of an effort specifically directed toward increasing the dimensional stability of alpha-rolled, alpha-annealed uranium by alloying. Additional data on many of the alloys which describe the effect of beta and gamma-phase heat treatments on the dimensional stability during thermal cycling are also presented. (P10d, 2-11, 2-14; U)

335-P. Thermal Distortion of SAR Reactor Hafnium Control Rod. W. H. Goldthwaite, C. M. Allen and S. L. Fawcett. *U. S. Atomic Energy Commission,* BMI-1099, June 27, 1957, 18 p. (CMA)

A study of the thermal distortion of a Y-shaped hafnium control rod showed that the radiation heating method employed is suitable for such testing. The large axial and radial temperature gradients specified were met. The distortion amounted to a 2-mil. movement of the free end of the rod in the direction of the coolest blade. (P10d, T11j, 17-7; Hf)

336-P. Impurities in Semiconductors. J. H. Scaff. Lecture No. 4 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 88-132.

Role of impurities and impurity distribution in preparation of semiconductor devices and chemical and metallurgical procedures whereby desired distributions are obtained. 39 ref. (P15g, 3-19)

337-P. Electrical Conductivity of Uranium. Karl F. Smith. Argonne National Laboratory, *U. S. Atomic Energy Commission,* ANL-5700, Part B, Apr. 1957, 25 p.

Data on electrical conductivity of uranium, including British work on purity, study of transition temperature effects and other unusual points such as the effects of annealing temperature, cycling growth, preferred orientation and hydrostatic pressure; comments in the literature on superconductivity of uranium are also covered. 50 ref. (P15g; U)

338-P. Pile-Induced Threshold Reactions in Stainless Steel. R. P. Schuman and A. C. Mewherter. General Electric Co., *U. S. Atomic Energy Commission,* KAPL-1779, May 24, 1957, 14 p. (Available from U. S. Office of Technical Services, $.20.)

Pure samples of the major components of stainless steel have been irradiated in a receptacle slug in the BNL reactor. Radiochemical separations were made and the yields of long-lived activities produced by (n,p), (n,2n), and (n,α) reactions were determined. It was found that Co-58 from Ni-58 (n,p) Co-60 from Ni-60 (n,p), and Mn-54 from Fe-54 (n,p) were important activation products with yields comparable to Fe-59 from Fe-58 (n,γ). (P18h, SS)

339-P. (French.) **Temperature-Electric Resistance Curves for Thin Films of Bismuth.** Pierre Huet and Antoine Colombani. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 865-868.

Study of variation of resistance showed both reversible and irreversible modifications as well as semiconductor and metallic states. Three ranges of thickness studied; temperature coefficient curves in relation to thickness were traced. (P15g; Bi, 14-12)

340-P. (French.) **Anomalies of Hysteresis Cycles Due to Diffusion Lag.** Pierre Brissonneau. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 868-870.

Study of magnetic hysteresis of a specimen of carburized Armco steel exhibiting a very pronounced diffusion lag. 5 ref. (P16a; ST)

341-P. (French.) **Influence of Temperature on Height of Potential Barrier in Selenium Photo-Cells.** Georges Blet. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1754-1756.

Electromotive force under vacuum of a selenium photo-cell studied at low temperature to determine variations in height of potential barrier as related to temperature variations. (P15, 2-11; Se)

342-P. (German.) **Iron-Silicon Alloys With Cubic Structure.** Fritz Assmus, Richard Boll, Dieter Ganz and Friedrich Pfeifer. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 341-343.

Induction and torque are reported which occur during magnetizing of 3% Si iron alloy with cubic structure in different directions. Preferential directions lay in the plane of rolling parallel and perpendicular to the rolling direction and have about equal magnetic properties. Characteristic parts of the induction curve can be calculated successfully from the spread in orientation. The results are compared with those on Goss material. The properties in rolling direction are about equal. However, having two preferential directions instead of one (as the Goss material has) opens new applications for the cubic material. (P16r, 3-22; Fe, *Si*)

343-P. (Japanese.) **Shrinkage of Cast Iron Held at High Temperature in a Dilatation Test.** Shiro Morita. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 307-310.

Expansion study of gray cast iron by dilatometer, the test piece being heated to 950° C. Result showed that some gray cast iron shrinks rather than expands. (P10d, 1-4; CI)

344-P. Hall Coefficient of Technically Pure Metals from 80 to 800° K. Pt. 1. V. Frank. *Applied Scientific Research,* v. 6, no. 5B, 1957, p. 379-387.

Results for Cu, Ag, Au, Pd and Pt. 19 ref.
(P15, 2-13; Cu-a, Ag-a, Au-a, Pd-a, Pt-a)

345-P. Low-Temperature Resistivity of Transition Elements; Vanadium, Niobium, and Hafnium. G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 35, Aug. 1957, p. 892-900. (CMA)

Thermal and electrical conductivity data were obtained in the ranges 2-90° K. and 2-300° K., respectively, for the metals vanadium, columbium and hafnium. Ice-point values of the "ideal" electrical resistivity are given and those for the "ideal" thermal resistivity are deduced. 23 ref.
(P11, P15g, 1-13; V, Cb, Hf)

346-P. Equilibrium Conditions in the Copper - Oxygen - Cadmium - Phosphorus System. A. D. Michael, R. W. Ruddle and A. Cibula. *Institute of Metals, Journal,* v. 85, Aug. 1957, p. 506-517.

Results of a series of slag-metal fusions in which copper containing small amounts of phosphorus and cadmium was brought into equilibrium at 1200° C. with a copper-oxygen-cadmium-phosphorus slag. A further series of fusions were made with cadmium-free metal and slag. 7 ref. (P12; Cu, *O, Cd, P,* RM-q)

347-P. Resistance and Magneto-Resistance of Dilute Alloys of Copper and Gold With Nickel at Low Temperatures. G. J. Los and A. N. Gerritsen. *Physica,* v. 23, July 1957, p. 633-640.

In continuation of a systematic investigation on the electrical properties of alloys of noble metals and transition metals at low concentration, electric resistance measurements on dilute copper-nickel and gold-nickel alloys are reported. 7 ref. (P15g, 2-13; Cu, Au, Ni)

348-P. Antiferromagnetism of Manganese Copper Alloys. G. E. Bacon. *Royal Society, Proceedings,* v. 241, Aug. 7, 1957, p. 223-238.

Manganese-rich gamma phase alloys of manganese and copper have been investigated by neutron and X-ray diffraction techniques, and the temperature variations of magnetic susceptibility and electrical resistivity have been measured. The disappearance of long-range antiferromagnetic ordering has been correlated with the face-centered-tetragonal→face - centered - cubic martensitic transformation of these alloys. The Neel temperatures and the magnetic moments of the manganese ions, for alloys of various compositions, have been determined. 21 ref.
(P16, P15g, N6q; Mn, *Cu*)

349-P. Calorimetric Investigation of Zirconium, Titanium and Zirconium Alloys From 60 to 960° C. J. L. Scott. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2328, Aug. 12, 1957. 122 p. (CMA)

Full benefits of zirconium as a nuclear metal may be realized only by alloying for high-temperature strength. Changes in thermodynamic functions (i.e., specific heats and heats of transformation) with the kind and amount of additive were studied for zirconium and titanium to better understand alloying behavior. Zirconium alloys with 0.881-5.37% Ag, 7.77% In, 17.5% Nb, 34.4% Ti and 300 ppm. hydrogen were investigated. 40 ref.
(P12; Zr, Ti)

350-P. (French.) **Attempt at Interpretation of the "Creeping" of Hysteresis Cycles.** Louis Neel. *Comptes Rendus,* v. 244, May 27, 1957, p. 2668-2674.

It is possible to interpret phenomena of "creeping" by assuming that the successive hysteresis cycles, described within the same limits and macroscopically identical, actually differ microscopically. (P16a)

351-P. (French.) **Transmission of Heat by Liquid Metals Flowing in Circular Pipes.** *Ministere de l'Air, Publications Scientifiques et Techniques,* no. N.T. 63, 1956, p. 15-25.

Laminar convection and turbulent convection: summary of theories, equations and experimental results of various researchers. (P11j; 14-10)

352-P. (French.) **Electrical Conductivity of Very High Purity Metals at Very Low Temperatures and Application to Phenomena of Recrystallization.** Michel Caron. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 328, 1957, 58 p.

Chemical analysis of aluminum and iron specimens studied; apparatus used; influence of recrystallization of pure aluminum on electrical conductivity; electrical resistance of pure aluminum at very low temperatures; conductivity of high-purity iron at low temperatures; conclusions. 33 ref. (P15g, 2-13; Fe-a, Al-a)

353-P. (German.) **Attack on Iron by Zinc Melts Containing Cadmium.** Dietrich Horstmann. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 195-199.

Cadmium increases the attack by molten zinc on iron. Determination of the iron loss and the growth of the iron-zinc alloy layer, time and temperature dependence of the attack and the relationship between the temperature dependence of the attack and the melt equilibrium of zinc-cadmium alloys.
(P12, R6m; Fe, Zn, *Cd*)

354-P. (German.) **Studies on the Electrolytic Absorption of Carbon, Boron, Nitrogen Chromium, Silicon and Phosphorus in Steel and Armco Iron.** Friedrich Erdmann-Jesnitzer. *Neue Hütte,* v. 2, June 1957, p. 349-361.

Principles of electrolytic absorption in the solid state; preparation of test pieces; microhardness values; spectroscopic analysis differences caused by various types of crystals; preparation of nitrogenous test pieces; electrolytic absorption of nitrogen. 31 ref.
(P15p; ST, Fe, *C, B, N, Cr, Si, P*)

355-P. (Rumanian.) **Determination of the Rate of Reaction Between Molybdenum Sulphide and Molybdenum Trioxide II.** I. Galatenu. *Revista de Chimie,* v. 8, May 1957, p. 363-369. (CMA)

The rate of the reaction $MoS_2 + 6MoO_3 \rightleftarrows 7MoO_2 + 2SO_2$ was studied with regard to its dependence on the initial proportion of the reagents and on the temperature. Optimum data for conducting the reaction under industrial conditions were derived. 14 ref. (P13d, C general; Mo)

356-P. (Russian.) **Investigation of the Thermodynamic Properties of Binary Metallic Systems by the Electromotive Force Method. Pt. 2. System Cadmium-Copper.** A. V. Nikol'skaya, P. P. Otopkov and Ya. I. Gerasimov. *Zhurnal Fizicheskoi Khimii,* v. 31, May 1957, p. 1007-1012.

E.m.f. of the concentration cells $Cd/CdCl_2/(Cd_xCu_{1-x})^+$ for copper-cadmium melts over the range 0.948—0.460 mole fractions of cadmium at 25° temperature intervals from 575 to 650° C. 8 ref.
(P12, M24; Cd, Cu)

357-P. (Russian.) **Solubility of Thorium in Liquid Zinc.** M. V. Smirnov, N. G. Hyushchenko, S. P. Detkov and L. E. Ivanovskii. *Zhurnal Fizicheskoi Khimii,* v. 31, May 1957, p. 1013-1018.

Thorium-zinc alloys containing up to 25% thorium by weight were investigated. These were shown to consist of two phases; practically pure zinc and the metallic compound Th_2Zn_{17}. The latter was isolated by dissolving the excess zinc of the alloys in aqueous solutions of ammonium salts or in alkalis. The solubility of thorium in liquid zinc was determined at 419 to 825° C. 3 ref. (P12e; Zn, Th, 14-10)

Mechanical Properties and Tests

797-Q. How To Apply Hardness Testing in the Shop. Vincent E. Lysaght. *American Machinist,* v. 101, Aug. 12, 1957, p. 133-140.

Brinell and Rockwell tests and problems relating to their proper use in quality control; machines in current use. (Q29, 1-3)

798-Q. Tensile Properties of Pearlitic Nodular Irons in Air and Water. G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, June 1957, p. 630-637.

Examines and compares tensile strength of as-cast and pearlitic nodular irons in air, water, mercury, trichlorethylene, ethyl alcohol, butyl acetate, butyl alcohol ethyl ether and glycerine. (Q27a, 2-16; CI-r)

799-Q. High Temperature Tensile Properties of Nodular Graphite Cast Irons. K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, June 1957, p. 638-659.

Investigation of tensile properties of two pearlitic and two ferritic industrially produced nodular irons for temperatures up to 600° C.; effects of varying arsenic, phosphorus and other minor element content on high-temperature tensile properties. (Q27a, 2-12, 2-10; CI-r)

800-Q. Effect of Understressing on the Fatigue Properties of Coarse Flake Graphite Cast Irons. K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, June 1957, p. 660-665.

Understressing for 20 million cycles at stress of 0.5 ton per sq. in. below fatigue limit did not significantly change fatigue limit or fatigue life for two coarse-flaked graphite cast irons in unnotched specimens. Slight increases found in notched fatigue limit. 3 ref. (Q7a; CI)

801-Q. Effect of Heating and Cooling on The Mechanical Properties of an Alloy Steel. A. S. Kenneford and T. Williams. *Chartered Mechanical Engineer,* v. 4, June 1957, p. 292-293.

Tensile, impact tensile and Charpy impact determined for a chromium-molybdenum steel heated at temperature above upper critical range, followed by cooling at two different rates. (Q27a, Q27b, Q6n, 2-14; AY, *Cr, Mo*)

802-Q. Stress-Relaxation Behavior of Chromium-Molybdenum and Chromium-Molybdenum-Vanadium Bolting Materials. J. A. Stafford and M. G. Gemmill. *Chartered Mechanical Engineer,* v. 4, June 1957, p. 295-296.

Behavior of bolt steels under constant strain and weight-bar tests. (Q3a; AY, *Cr, Mo, V*)

803-Q. Improving the Mechanical Properties of Cast Steel. B. B. Guljajew. *Foundry Trade Journal,* v. 103, July 4, 1957, p. 5-10, 12.

Effect of forging, alloying additions, heat treatment on mechanical properties of cast steel; influence of defects on mechanical properties and relation of defects to deoxidation; speed of solidification, feeding method and mold design. (Q general, E25n; ST, 5-10)

804-Q. Damping Behavior of Quenched Aluminum-Copper-Magnesium-Silicon Alloys. K. M. Entwistle. *Institute of Metals, Journal,* v. 85, June 1957, p. 425-430.

Damping measurements made on a range of aluminum-copper-magnesium silicon alloys quenched from solution treatment temperatures; damping changes took place in supersaturated quaternary alpha phase and associated relaxation strength increased progressively with degree of supersaturation. 8 ref. (Q8; Al, *Cu, Mg, Si*)

805-Q. Effects of Solid Environments on the Brittle Fracture of Zinc Single Crystals. L. C. Weiner and M. Gensamer. *Institute of Metals, Journal,* v. 85, June 1957, p. 441-448.

Tensile tests carried out on both clean and coated zinc single crystals followed effects of copper, gold, tin and zinc oxide coatings; effects of prestrain, of recovery and of film removal on tensile properties and metallographic structure; experimental observations explained in terms of dislocation pile-up model and modification of dislocation path by twins. 38 ref. (Q26, M26b; Zn, 14-11)

806-Q. How Defects Affect Tensile Strength of Light Alloy Castings. Herman Mansfield. *Iron Age,* v. 180, July 4, 1957, p. 75-77.

Investigates correlation between defects indicated by X-ray and tensile strength of aluminum-base and magnesium-base alloys. (Q27a; Al, Mg, 5-10, 9)

807-Q. Higher Vanadium Improves Hot Strength of Low Alloy Steel. Paul Shahinian and J. R. Lane. *Iron Age,* v. 180, Aug. 1, 1957, p. 91-95. (CMA)

The higher vanadium content results, to some extent, in a better alloy, but this advantage is balanced by the necessity of using higher normalizing temperatures. Properties examined included rupture strength, creep strength and ductility; graphs indicate creep and rupture strengths of the seven melts studied. (Q3m, 2-10; AY, *V*)

808-Q. Brittle Fracture of Mild Steel. Leslie Aitchison. *Iron and Coal Trades Review,* v. 174, May 31, 1957, p. 1273-1275.

Survey of present knowledge on brittle fracture and suggestion of suitable alloying as a cure. (Q26s, 2-10; CN)

809-Q. Effect of Stress on Creep at High Temperatures. H. Laks, C. D. Wiseman, O. D. Sherby and J. E. Dorn. *Journal of Applied Mechanics,* v. 24, June 1957, p. 207-213.

Effects of variables in stress and strain on activation energy for high-temperature creep of aluminum and its dilute alloys. Creep-rate equation for a constant structure. Theory of dislocation-climb for high-temperature creep. 14 ref. (Q3m, Q3n, 2-12; Al)

810-Q. A Statistical Appraisal of the Prot Method for Determination of Fatigue Endurance Limit. W. A. Hijab. *Journal of Applied Mechanics,* v. 24, June 1957, p. 214-218.

Comparison of relative efficiency of Prot method with staircase and probit methods. Derivation of general formula. 12 ref. (Q7, 1-4)

811-Q. Low-Temperature Deformation of Copper Single Crystals. T. H. Blewitt, R. R. Coltman and J. K. Redman. *Journal of Applied Physics,* v. 28, June 1957, p. 651-660.

Observations at 4.2 and 77.3° K. Presence and absence and effects of reactor irradiations on discontinuous slip and twinning. (Q24, 2-13, 2-17; Cu, 14-11)

812-Q. Study of Temper-Brittleness in Cr-Mn Steel Containing Large Amounts of Molybdenum, Tungsten and Vanadium. A. E. Powers. *Journal of the Iron and Steel Institute,* v. 186, July 1957, p. 323-328.

Susceptibilities determined for a 1% Cr, 1% Mn steel to which was added up to 2% molybdenum, 4% tungsten, 1½% vanadium, and combinations of these elements. Combination of molybdenum and vanadium resulted in less susceptibility than either element alone. Theory for mechanism of temper brittleness is given. 22 ref. (Q26s, AY, *Cr, Mn*)

813-Q. Component Fatigue Analysis for Maintenance. R. J. Laux. *Mechanical Engineering,* v. 79, July 1957, p. 656-658.

Fatigue failures in stressed machine parts; methods used in combatting fatigue failures and portable equipment for vibration analysis. (Q7, 1-3)

814-Q. Ductility of Molybdenum. *Metal Industry,* v. 91, July 5, 1957, p. 6, 12.

Effects on transition temperature of molybdenum of following alloying additions: aluminum, boron, cerium, thorium, titanium, vanadium and zirconium. (Q23p, 2-10; Mo)

815-Q. Mechanical Properties of C355 Aluminum Casting Alloy. T. H. Owen and L. E. Marsh. *Metal Progress,* v. 72, Aug. 1957, p. 78-83.

This high-purity, low-iron alloy, adequately degassed, will have elongation 100% better than standard 355 alloy at equal ultimate and yield or, when elongation is equal the ultimate and yield of C355-T 62 are 25 to 30% higher than 355-T 6. (Q27a, E25s, J27a, 1-10; Al)

816-Q. New Magnesium Alloys for High Temperatures. T. E. Leontis. *Metal Progress,* v. 72, Aug. 1957, p. 97-103.

Addition of thorium up to 4% (in combination with Zr, Mn and Zn) produces magnesium castings, sheet and extrusions of superior short-time tensile properties up to 800 or 900° F., markedly better creep resistance up to 700° F., and raises the temperatures limit of utility above 600° F. as well as extends the range of applications in the 300 to 500° F. range. (Q general, 2-12, 2-10; Mg, *Th,* AD-n, AD-q)

817-Q. Hille-Wallace Sheet-Metal Testing Machine. J. R. Wallace. *Sheet Metal Industries,* v. 34, May 1957, p. 343-344, 348.

Description of sheet metal testing machine with mechanical drive and hydraulic blank holder designed for 2-in. Swift forming test and adaptable to other forms of sheet metal testing such as stretch-forming tensile expanding hold; operation of the machine. (Q23q, 1-3; 4-3)

818-Q. A Power-Operated Press for the Swift Cup-Forming Test. E. Coupland. *Sheet Metal Industries,* v. 34, May 1957, p. 345-347.

Cup drawing press is small double action press with hydraulically controlled main ram and pneumatically controlled pressure plate; press operation. (Q23q, 1-3; 4-3)

819-Q. Prediction of the Cupping Properties of Sheet Metals by the Use of Ultimate Tensile Strength. Emerson N. Ludington. *Sheet Metal Industries,* v. 34, July 1957, p. 485-490.

Investigates aluminum, titanium, brass, copper, zirconium and stainless steels under cupping conditions which give load below maximum

value. Result indicates straight-line relationship between load and percentage reduction; gives equation for maximum cupping load taking into account tensile strength, material thickness, and cup diameter. 10 ref.
(Q23q, Q27a; Al, Ti, Cu, Zr, SS, 4-3)

820-Q. Brittle Fracture of Mild Steel. Leslie Aitchison. *Sheet Metal Industries,* v. 34, July 1957, p. 523-525.

Present state of knowledge on the nature of brittle fracture; origin and propagation of cracks; relation of notched-bar value at different testing temperatures and influence of manganese and nickel content on brittle fracture. (Q26, 2-10; CN)

821-Q. Fatigue Properties of Welds. J. G. Whitman. *Sheet Metal Industries,* v. 34, July 1957, p. 529-538.

Factors responsible in reduction of fatigue strength of a welded joint; information on fatigue strength of butt and fillet welds of mild steel, high-tensile steel, aluminum alloys. Fatigue strength of spot welds in aluminum alloys and steels, application of fatigue to design, and improvement in fatigue strength by various treatments. 12 ref.
(Q7a; Al, ST; 7-1)

822-Q. Tool Steels. Pt. 3. L. F. Spencer. *Steel Processing and Conversion,* v. 43, July 1957, p. 372-379, 402-403.

Factors in selection of toolsteels for cold working operations involving a shearing action, a bending action, plastic flow under tensile loading or operations which involve compression; considers dimensional stability during heat treatment, hardenability, toughness, wear resistance, machinability, hot hardness, depth of hardness, susceptibility to decarburization and quenching media for toolsteels. (Q general, P10d, J5; TS)

823-Q. Structural Steels. A Preliminary Investigation of the Relation of Hot Tensile Properties to: (a) Composition and State of Deoxidation, and (b) Weldability. W. G. Beynon. *Welding and Metal Fabrication,* v. 25, July 1957, p. 262-264.

Series of rolled steels with varied aluminum and nitrogen contents was tested. Suggested that weld metal should have greater hot ductility and less hot strength than the material to be welded to reduce hot cracking.
(Q27a, 2-12, K9s; ST, SGB-s)

824-Q. Residual Elements in Steel. James W. Halley. Lecture no. 3 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 71-87.

Beneficial and detrimental effects on steel of copper, phosphorus, nitrogen, molybdenum, manganese, chromium and hydrogen. 11 ref.
(Q general, 2-10; ST)

825-Q. Newer Metals—Titanium, Zirconium, Molybdenum and Chromium. D. J. McPherson. Lecture no. 5 of "Effect of Residual Elements on the Properties of Metals," American Society for Metals, p. 133-210.

Effects of trace impurities on physical and mechanical properties, transformation kinetics, welding and machining. 74 ref.
(Q general, P general, 3-19; Ti, Zr, Mo, Cr)

826-Q. Creep of Nodular Cast Iron. V. S. Ivanova and I. A. Oding. *Izvestiya Akademii Nauk, OTN,* no. 7, 1955, p. 89-92. (*Henry Brutcher Translation* no. 3767.)

Previously abstracted from original. See item 1037-Q, 1956.
(Q3, M27; CI-r)

827-Q. Effect of Small Quantites of Certain Alloying Elements Upon Temper Brittleness. I. E. Kontorovich. *Fizika Metallov i Metallovedenie,* v. 3, no. 3, 1956, p. 553-555. (*Henry Brutcher Translation* no. 3994.)

Literature data on presumable nature of effect of low aluminum contents in structural steels on their susceptibility to temper brittleness. Beneficial influence of beryllium on temper embrittlement in range from 480 to 750° F.; effects of 0.001, 0.01, 0.1 and 0% Be on impact values of 0.35% C, 1.2% Cr steel at different tempering temperatures; similarity to effect of Al; results of experiments on effect of 0.1 to 1.0% Ti or Cb.
(Q26s, 2-10; AY, *Al, Ti, Cb*)

828-Q. (German.) **Tendency to Embrittlement of Steels as Dependent on the Stress Condition and Temperature.** Albert Kochendörfer and Herbert Scholl. *Stahl und Eisen,* v. 77, July 25, 1957, p. 1006-1018.

Shapes of test bars examined and multi-axiality figures; yielding and rupturing stress as dependent on the multi-axiality figure and temperature; representation of this depenency in three-dimensional diagrams; brittle fracture temperature and transition temperature as dependent on stress condition; arrangement of the results of notched bar impact tests; conclusions to be drawn for testing tough or brittle fracture behavior. (Q26s, Q6, 1-4; ST)

829-Q. (German.) **Strain Gages and the Testing of Materials.** Walter Köhler. *Werkstoffe und Korrosion,* v. 8, July 1957, p. 389-393.

Strain gages are used for static tensile strength testing by checking the accuracy and the linearity of indication under single and multiple stress in the elastic range. 12 ref.
(Q27a, 1-3, W28h)

830-Q. (Italian.) **Influence of the Shape of Samples on the Fatigue Resistance of Peraluman 50 Alloy.** F. Gatto. *Alluminio,* v. 24, June 1957, p. 251-254.

Fatigue tests under rotating bending loads were carried out to determine differences between results obtained using cylindrical samples. For the Peraluman 50 (5% Mg aluminium alloy) a difference of 1.0 kg. per sq. mm. of the fatigue limit, equal to 6% was observed. 5 ref.
(Q7c, 1-10; Al)

831-Q. Spring Properties of Titanium and Its Alloys. K. Hojo. *Nippon Telegraph and Telephone Public Corp., Electrical Communication Laboratory, Reports,* v. 5, Feb. 1957, p. 8-11. (CMA)

Spring tests were performed on titanium and the alloys Ti-2Al, Ti-8Mn and Ti-1Fe-3Cr in the form of cold rolled sheet. The spring limit in titanium is increased by degree of cold rolling, and increases with annealing temperature up to a maximum at 400° C. The spring limit for each of the materials noted is given. (Q10; Ti, SGA-b)

832-Q. Mechanical Properties of Zircaloy-2. G. T. Muehlenkamp and A. D. Schwope. *U. S. Atomic Energy Commission,* TID-10016, Oct. 20, 1953, 10 p. (CMA)

Tensile, impact and hot hardness properties of Zircaloy-2 were measured at different temperatures for hydrogen contents up to 410 ppm. Tensile strength is little affected by less than 400 ppm. of hydrogen. Increasing amounts of hydrogen increased the impact transition temperature. Hot hardness and fatigue strength were not affected up to 500° C. (Q general; Zr, *H*)

833-Q. Effect of Irradiation on the Properties of Boron-Stainless Steel Powder Dispersion Samples. J. D. Eichenberg. Westinghouse Electric Corp., *U. S. Atomic Energy Commission,* WAPD-160, Jan. 2, 1957, 27 p.

No gross dimensional change or warpage was produced as a result of the irradiation, and no changes were evident in the microstructure of the samples. The hardness of all the samples increased approximately 175 DPH units and was not dependent on exposure. The results of the tensile and impact tests indicated that the samples were almost completely embrittled as a result of the irradiation. 4 ref.
(Q general, 2-17; SS)

834-Q. Thermal Buckling. F. V. Pohle and I. Berman. Polytechnic Institute of Brooklyn. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121512, May 1956, 37 p. $1.

Uses a simply supported rectangular plate to illustrate the thermal buckling problem in a project aimed at comparing the various methods for determining the characteristic parameter in the buckling problem. Methods are discussed with particular attention to the choice of the most effective method to use in the problem of the thermal buckling of a cylinder. (Q28, 2-12)

835-Q. Notch Sensitivity of Heat-Resistant Alloys at Elevated Temperatures. Pt. 3. Final Data and Correlations. H. R. Voorhees and J. W. Freeman. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121791, Jan. 1956, 88 p. $2.25.

Results indicated that elevated-temperature rupture characteristics of notched specimens under a steady tensile load depend on three factors: distribution and level of the initial stress pattern; the rate at which variable creep rates at different locations in the cross section are able to relax peak stress originally concentrated near the notch; and rupture characteristics of the material at the prevailing stresses and for the prior history experienced by different fibers in the notched bar. (Q3m, 2-12; SGA-h)

836-Q. Dependence of Tension and Notch-Tension Properties of High-Strength Steels on a Number of Factors. Pt. 1. B. B. Muvdi, G. Sachs and E. P. Klier. Syracuse University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121847, Dec. 1956, 66 p. $1.75.

In general, tensile strength was found to be independent of specimen orientation, but to decrease gradually with increase in specimen size. The ductility of smooth specimens, however, was observed to depend on both specimen orientation and specimen size. The notch strength decreased with increase in stress concentration, specimen diameter and as-processed section size. It also decreased as the specimen orientation was changed from longitudinal to transverse.
(Q27a, 1-10; ST, SGB-a)

837-Q. Axial-Load Fatigue Properties of High-Strength Steel. Pt. 2. B. B. Muvdi, G. Sachs and E. P. Klier. Syracuse University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121883, Dec. 1956, 46 p. $1.25.

Tests indicate that the fatigue strength was lowered as the stress-concentration factor was increased, a maximum lowering effect occurring for stress concentration factors between one and three. This effect was observed to depend upon the strength level. The endurance limit for both smooth and notched specimens developed minimum values at a strength level between 240,000 and 260,000 psi., and maximum values at a strength level between 270,000 and 300,000 psi. approximately. In general, the endurance limit was found to be lower for transverse than for longitudinal specimens.
(Q7a; ST, SGB-a)

838-Q. Evaluation of Dry-Film Lubricant Coatings. Pt. 1. W. C. Hart. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121922, Sept. 1954, 29 p. 75c.

The most successful types of dry film lubricants have excellent properties for plain bearing applications at low speeds. Materials studied were commercial baked resin-bonded films and spray can coatings with graphite or molybdenum disulphide, experimental baked resin-bonded films with molybdenum disulphide and a variety of resin bases, and air-drying coatings applied by dipping. (Q9p; NM-h)

839-Q. Retainer Materials for Aircraft Gas-Turbine Bearings. P. F. Mataich and F. C. Wagner. Horizons, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121935, Aug. 1956, 34 p. **$1.**

Developmental work concentrated on various boride, carbide and silicide additions to a silver-infiltrated nickel matrix produced by powder metallurgy. The borides were found to have the best properties. A 7% chromium boride addition was best among several compositions with superior wear characteristics.
(Q9n, T7d; Ni, *Ag,* 6-21)

840-Q. Improving Fatigue Life of Formed Stainless Steel Hydraulic Tubing by Prestressing. C. S. Yen and B. V. Whiteson. Douglas Aircraft Co., Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121969, May 1956, 57 p. **$1.50.**

Results showed that the higher the prestressing pressure the greater were fatigue life and tube permanent deformation. Prestressing brought a weight saving of 12 to 35% in formed tubes designed for a given power transmission and for survival of one-million cycles of constant pressure pulsing.
(Q7a, G23q; ST, 4-10)

841-Q. Dynamic Stress Distribution Surrounding a Running Crack. A Photo-Elastic Analysis. A. A. Wells and D. Post. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121987, Apr. 1957, 29 p. **$.75.**

Dynamic stress distributions in the vicinity of the crack approximated static distributions in models extended at their ends by a fixed displacement. At greater distances from the crack the distributions approached those for constant load during fracture. For the crack unaffected by the pressure of external plate edges, the surrounding zone of stress-and-strain disturbance grows in all directions proportionally to crack length. (Q25, W28p, 1-2)

842-Q. Interrelation of Fatigue Cracking, Damping and Notch Sensitivity. L. J. Demar. University of Minnesota. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131025, Mar. 1957, 164 p. $4.25.

Results of numerous fatigue tests performed on a variety of metallic materials in which observations were made of the changes in damping and stiffness properties of the specimens and of the development of fatigue macrocracks. Test results are discussed in relation to previous investigations, and new relations between dynamic properties of materials are evolved. (Q7, Q8, Q23s)

843-Q. Studies of Factors Affecting Thermal Stability of Titanium-Base Alloys. F. C. Holden, H. R. Ogden and R. I. Jaffee. Wright Air Development Center, Technical Report 56-597. *U. S. Office of Technical Services,* PB 131043, Feb. 1957, 62 p. (CMA)

A study showed that thermal stability was good in Ti-6Al-4V, Ti-155A and C-130AM under creep exposure tests through 800° F. The alloys were in three heat treated conditions. The last two alloys showed some loss of ductility. A study of the effects of nickel, copper and chromium additions on the thermal stability of Ti-5Cr-5Mo showed that they were detrimental; manganese, molybdenum and aluminum additions were beneficial. Small amounts of strain applied before equilibration or after stabilization had no significant effect. (Q general, 2-12; Ti)

844-Q. Notch Toughness of Weld Deposits in Commercial Titanium Alloys. D. M. Daley, Jr., and C. E. Hartbower. Watertown Arsenal Laboratory, Report 401/221. *U. S. Office of Technical Services,* PB 131109, July 1956, 31 p. (CMA)

Sigma welds on commercial titanium, Ti-7Mn and Ti-4Cr-2Fe were tested for weld metal toughness through a range of temperatures, using the V-notch Charpy impact test. (Q6n; Ti, 7-1)

845-Q. Room Temperature Tensile Properties of Several Titanium Alloys After Being Heated in Argon at Temperatures of 1400-1800° F. W. H. Duffy. Watertown Arsenal Laboratory, Report 401/219. *U. S. Office of Technical Services,* PB 131110, July 1954, 36 p. (CMA)

After heating titanium, Ti-8Mn, Ti-4Al-4Mn and Ti-2.7Cr-1.3Fe in argon for 24 hr. in the 1400 to 1800° F. range, the furnace-cooled or air-cooled samples were subjected to tensile tests. The effect on microstructure of the heat treatment was determined by etching and microscopy. (Q27a, 2-14; Ti)

846-Q. Investigation of Mechanical Properties of Metal-Arc Welded Ti-6% Al-4% V. D. M. Daley, Jr. and C. E. Hartbower. Watertown Arsenal Laboratory, Report 401/250. *U. S. Office of Technical Services,* PB 131114, Sept. 1956, 18 p. (CMA)

Ti-6Al-4V as welded gives satisfactory properties when using matching filler. Tensile joint efficiency was about 100% with an ultimate strength of 150,000 psi. The heat-affected zone had a notch toughness greater than any other commercial alpha-beta titanium alloy tested. (Q general; Ti, 7-1)

847-Q. Some Wear Characteristics of Titanium. H. F. Campbell. Watertown Arsenal Laboratory, Report 401/234. *U. S. Office of Technical Services,* PB 131113, Mar. 1956, 18 p. (CMA)

Reciprocating sliding wear tests on combinations of titanium with silver, steel, Monel and Babbitt metal were conducted, with and without lubricant. Bearing pressures of 500 psi. were used with Babbitt metal and 2500 psi. pressures for the others. Wear was determined visually and by computing weight loss. (Q9n; 1-4; Ti)

848-Q. Study of Deformability of Technical Iron in the As-Cast State. G. N. Mekhed. *Metallovedenie i Obrabotka Metallov,* Aug. 1956, p. 43-47. (*Henry Brutcher Translation* no. 3970.)

Investigation of effect of testing temperature on ductility of industrially and laboratory-melted technical irons in the as-cast state; usefulness of various mechanical tests for revealing susceptibility to embrittlement; ductility of rimmed as against killed technical irons; effect of sulphur and oxygen contents on ductility at 850-1050° C.; effect of manganese content; determination of ranges of cold shortness, blue-shortness and red-shortness.
(Q23p; CI)

849-Q. Effect of Metallurgical Factors Upon Temper Brittleness. S. M. Baranov. *Metallovedenie i Obrabotka Metallov,* no. 12, 1956, p. 40-45. (*Henry Brutcher Translation* no. 4013.)

Study of relationship between melting practice and structure and properties of steel. Importance of formation of silicon monoxide for occurrence of reversible and irreversible temper brittleness. Principles of melting steel so as to be free from temper brittleness. (Q26s; ST)

850-Q. Variation of Mechanical Properties of Vacuum Melted and Vacuum Cast Steel Ingots in Different Directions. Ya. B. Gurevich. *Stal',* v. 16, no. 9, 1956, p. 815-817. (*Henry Brutcher Translation* no. 4017.)

Previously abstracted from original. See item 1050-Q, 1956.
(Q general, D8, 1-23; CN, Ay)

851-Q. (French.) **Contribution to the Study of the Embrittlement of Alpha Steels by Cold Introduction of Hydrogen and the Diffusion of Hydrogen in These Steels.** P. Amiot. *Institut de Recherches de la Sidérigie, Publications,* Ser. A, no. 158, April 1957, 80 p.

Pt. 1: Influence of hydrogen on mechanical properties of low-alloy steels: tensile tests and hydrogen-induced brittleness; influence of cold working on hydrogen-induced brittleness; deferred fractures in presence of cathodic hydrogen. Pt. 2: Diffusion of hydrogen in steels at atmospheric temperature: potentiometric measurements; volumetric measurements. 67 ref.
(Q26s, Ni; ST, *H*)

852-Q. (French.) **Study of the Shape of Curves Produced by Plastic Deformation.** B. Jaoul. *Journal of the Mechanics and Physics of Solids,* v. 5, Mar. 1957, p. 95-114.

Precise analysis of shape of tensile test curves permits definition

of four mechanisms of deformation which appear in succession and correspond to different laws of strain hardening: pseudo-elastic deformation, where all slip is reversible; intergranular hardening, where some slip is still reversible; linear intercrystalline strain hardening, up to a transition point beyond which the rate of increase of work hardening diminishes. Respective ranges of each of these phases is strongly influenced by nature of the metal, its purity and testing temperatures. Certain phases can disappear and the four may not be observable simultaneously except under special conditions. 21 ref. (Q24)

853-Q. (German.) **Hardness Tests With Indentation Depth Gaging Using the Diamond Pyramid.** H. Mäkelt. *Werkstatt und Betrieb,* v. 90, July 1957, p. 444-446.

In the Vickers hardness testing method the indentation depth of the test sample may be used for the determination of hardness. The indentation hardness will also provide data for determining permanent stress and supply information regarding the permissible surface pressure for friction bearing materials. (Q29c)

854-Q. (German.) **Strength of Titanium Welded Joints.** K. Bungardt and K. Rüdinger. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 335-340. (CMA)

Welded joints on titanium sheets 10 and 22 mm. thick were investigated with regard to mechanical properties (tensile strength, impact strength, fatigue), corrosion resistance and gas absorption (during welding). The observations were made both on the joints and on the neighboring parts of the welded sheets. 14 ref.
(Q27a, Q6n, Q7a, R general; Ti, 7-1)

855-Q. (Italian.) **Characteristics of Metals and Alloys of Interest to Machinery Builders and Foundrymen.** Plinio Corbellini. *Fonderia,* v. 6, May 1957, p. 197-199.

Table of physical characteristics of 21 types of steel, cast iron and alloys used in machine construction; factors influencing cost and ease of machining; weldability, hardness and mechanical shock resistance as selection criteria.
(Q general, W general; ST, CI, 17-7)

856-Q. (Japanese.) **Study of Young's Modulus of Cast Metals.** Toshimasa Morooka. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 235.

Effect on Young's modulus of the addition of silicon to aluminum-silicon alloys; comparison of metal mold castings and sand mold castings; the relation between annealing time and Young's modulus.
(Q21a, 2-10, 2-14; Al, *Si,* 5-10, 5-13)

857-Q. (Japanese.) **Abrasion Resistance of Ductile Cast Iron.** Yasuhiro Nakagawa. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 241-242.

Determination of abrasion resistance of gray cast iron, steel and ductile cast iron at different speeds by an abrasion testing machine; comparison of abrasion resistance with and without oil. (Q9n; CI-r)

858-Q. (Japanese.) **Characteristics of High-Quality Cast Iron. Report 1.** Kisao Abe. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 254-256.

General mechanical properties, tensile strength, fatigue, corrosion, thermal growth and gas contents of alloy cast iron in relation to cupola operation. (Q general, E10a; CI)

859-Q. (Japanese.) **Galvanizing Embrittlement in Cold Bent Steel Pipes.** Hideo Kimizuka, Yoshio Shimokawa and Morio Nakajima. *Sumitomo Metals,* v. 9, Jan. 1957, p. 5-12.

Causes of brittleness in the galvanized pipe bends. Strain aging plays an important part in embrittlement. Pipes are not so brittle immediately after cold bending, but become brittle by heating at low temperature even if not galvanized. Most effective remedy is to anneal after bending.
(Q26s, G6, 1-17; ST, 4-10)

860-Q. (Japanese.) **Flaring Test and Flattening Test for Steel Tubes.** Toyohiko Okamoto. *Sumitomo Metals,* v. 9, Jan. 1957, p. 21-30.

Influence of the tube size and the tool angle on the tests. The maximum expansion of flaring test increases with increased thickness of tubes. The influence of the angle of tools used for expanding is not important but the maximum expansion increases slightly with increased angle. On the flattening of thin-walled tubes, cracks and breaks occurred at the free outside surface of tubes, but on thick-walled tubes, these occurred at the inner surface of the part in contact with parallel plate. (Q3q, 1-4; ST, 4-10)

861-Q. (Portguese.) **Selection of Carbon Steel Bars. Pt. 2.** Waldemar de Lima e Silva. *Engenharia, Mineracao e Metalurgia,* v. 25, Mar. 1957, p. 125-126.

Composition, characteristics of rimmed, killed, semikilled and capped steels; real and apparent grain size; effects of heat treatment on grain size; 12 classes of carbon steel; their composition and workability.
(Q general, M27c; CN, 4-5)

862-Q. (Russian.) **Wearing Quality of Carbon and High-Chromium Steels.** D. Y. Vishniakov and A. G. Vinitzki. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 2-9.

Samples were subjected to chemical, magnetic, physical and X-ray analysis. Tests showed that wear resistance increases with the quantity of carbides present in the samples. The resistance of carbon steels to the cutting action of abrasives rises if the cementite particles in the form of thin flakes is dispersed between flakes of ferrite. 5 ref. (Q9n; CN, AY, *Cr*)

863-Q. (Russian.) **Influence of Carbon on the Critical Interval of Cold Brittleness.** A. P. Gulyaev and N. P. Neverova-Skobeleva. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 17-21.

Carbon in different quantities affects brittleness under varying temperatures, quenching and cooling conditions. Critical temperature affecting brittleness falls off rapidly with the increase in carbon content. (6 ref. (Q26s, 2-10; ST)

864-Q. (Russian.) **Nature of Thermal Brittleness.** A. S. Zavyalov, L. R. Goldstein and M. I. Senchenko. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 21-30.

Impact strength of alloy steel varies greatly between −150 and +50° C. Above that it is almost constant to 200° C. Presence of phosphorus shows marked influence on the impact strength of chromium-molybdenum steel. 10 ref.
(Q26s, Q6n; AY, *Cr, Mo*)

865-Q. (Russian.) **Influence of Secondary Hardening in the Mid-Critical Interval on the Propensity of Certain Steels Toward Temper Brittleness.** B. G. Sazonov. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 30-34.

Influence of heat treatment on the inclination of certain alloy structural steels toward temper brittleness. After secondary hardening between the upper and lower critical temperatures steels are free of temper brittlenss. (Q26s, 2-14)

866-Q. (Russian.) **Mechanical Characteristics of Steel Deformed at High Temperatures.** E. N. Moshnine and D. I. Berezhkovshy. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 35-41.

Apart from temperature, the speed of deformation, length of heating, aging, uniformity of heating, also affect the mechanical properties of steel. Since little is known of the behavior of steel under heated conditions hot steel samples were exposed to various stresses. 5 ref.
(Q general, 2-12, 3-18; ST)

367-Q. (Russian.) **Influence of Residual Austenite on the Properties of Steels.** E. I. Malinkina. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 44-47.

The claim that the toughness of toolsteels regularly depends on the quantity of residual austenite in martensite is challenged. 4 ref.
(Q general, M27; TS)

868-Q. (Russian.) **Best Chemical Composition of Stainless Steel IXI8H9T.** M. I. Vinogradov. *Metallurg,* v. 2, May 1957, p. 13-16.

Discussion of stainless steel properties in respect to titanium contents. Recommendations are given for variations from the standard formula, in particular for pipe and sheet steels.
(Q general, 2-10; ST, *Ti*)

869-Q. (Russian.) **Reason for Variations of Steel Ductility at High Temperatures.** M. I. Vinograd. *Stal',* v. 17, Mar. 1957, p. 254-260.

In certain cases, the negative influence of the oxygen content in the metal on its ductility at high temperatures may be explained by the formation of easily fusible dispersed inclusions (films) containing silicon oxide. 4 ref. (Q23p, 2-10; ST, *O*)

870-Q. (Russian.) **Compression and Geometry of Deformation.** V. L. Raskind. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 55-58.

The formula for computation of the work of compression is based on the assumption that the volume of the billet remains constant on compression. Actually the billet assumes a barrel-like shape. Therefore, a new formula which takes into consideration the billet deformation is proposed. (Q28)

871-Q. (Russian.) **Resistance to Seizing of Stainless Steel.** B. Kh. Somin and C. L. Matzkevitsh. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 28-34.

General discussion of seizing of stainless steel shaft; 18 steel brands are investigated to determine the cause and remedy; four different types of lubricants are considered; best result is obtained by sand blasting of the shafts followed by phosphatizing and coating with a polyvinyl lacquer. 5 ref. (Q9n; SS)

872-Q. (Russian.) **Nature of Bright Areas on Friction Surfaces of Steel.** N. V. Seleznev, I. E. Brainin and P. I. Kuleshov. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 35-39.

Several hypotheses regarding microcrystalline changes of steel friction surfaces. Shows that the first part is bright; the second, dark; the third is intermediate and is only slightly harder than the metal itself. X-ray analysis confirms presence of austenite, martensite and cementite in the dark layer. As the surface temperature reaches 850° C. on friction without lubricant, some diffusion of carbon takes place. 8 ref. (Q9p, M27; ST)

873-Q. Internal Friction of Beta-Brass. L. M. Clarebrough. *Acta Metallurgica,* v. 5, Aug. 1957, p. 413-426.

Internal friction of polycrystals and single crystals investigated by method of low-frequency, free, torsional vibration. Six separate anelastic phenomena detected by varying composition and heat treatment of specimens. Interpretation of results in terms of Zener's pair-reorientation mechanism, stress relation at interfaces. 26 ref. (Q22, Cu-n)

874-Q. Stacking Faults by Low-Temperature Cold Work in Copper and Alpha Brass. C. N. J. Wagner. *Acta Metalurgica,* v. 5, Aug. 1957, p. 427-434.

Deformation faulting and twin faulting probabilities in terms of zinc content and filing temperature. 13 ref. (Q24, 2-13; Cu-n, *Zn*)

875-Q. X-Ray Study of the Plastic Deformation in Zinc Single Crystals. C. T. Wei. *Acta Metallurgica* v. 5, Aug. 1957, p. 435-442.

By use of Schulz techniques elliptical ring-shaped imperfections detected near crystal surface. Possible mechanisms for formation discussed. 9 ref. (Q24, M26s; Zn, 14-11)

876-Q. Impact Properties of Quenched and Tempered Alloy Steels. John P. Sheehan and Harry Schwartzbart. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 483-520.

All steels tested exhibited A-brittleness (500° F. embrittlement); the 2300 series exhibited B-brittleness (developed by a tempering temperature of 1200° F.). Addition of molybdenum minimizes temper brittleness (developed by a tempering temperature of 950 to 1150° F.). 12 ref. (Q6n, Q26s, 2-10; AY, *Mo*)

877-Q. Crack Initiation and Propagation in the V-Notch Charpy Impact Specimen. Carl E. Hartbower. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 521-539.

Two approaches were investigated. Both involved the initiation of a crack by means of an initial low-energy blow of the impact-machine pendulum. The first method determined the highest temperature at which the initial low blow caused complete fracture of the test specimen, that is, the temperature at which the low blow initiated a crack which then propagated by continuous release of the elastic stress field developed by the initial low blow. The second method required the measurement of lateral expansion after the crack-initiating low blow and again after a second, fracturing blow. 9 ref. (Q6, 1-4, Q26q)

878-Q. Tensile Study of the Brittle Behavior of a Rimmed Structural Steel. E. T. Wessel. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 540-554.

The factors involved in the initiation of a brittle (cleavage) failure in a rimmed structural steel were investigated using notched and unnotched tension tests at temperatures down to −269° C. Cleavage fractures which occurred at all temperatures below 100° C. were preceded by plastic deformation. 11 ref. (Q26s, Q27, 2-13; ST-d)

879-Q. Correlation of Torsional and Tensile Prestrain Effects on Fracture Properties. I. Rozalsky. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 621-644.

A correlation of the effects of room-temperature tensile and torsional prestrain upon the tensile fracture properties of annealed copper and spheroidized S.A.E. 1020 steel at various test temperatures from + 75 to − 321° F. 19 ref. (Q27a, Q1b, 2-11; CN, Cu)

880-Q. Effect of Brittle Skins on the Ductility of Metals. G. W. Form and W. M. Baldwin, Jr. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 645-661.

Brittle skins (for example, carburized cases) embrittle an otherwise ductile metal to a greater degree than would be anticipated by the percentage of bulk that the skin occupies. 25 ref. (Q26s, Q23p)

881-Q. Notch Tensile Behavior of Face Centered Cubic Metals. E. J. Ripling. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 662-671.

The notch insensitivity of face-centered cubic metals when tested at a constant rate and testing temperature was found to be a linear function of the unnotched strain hardening exponent. 6 ref. (Q23s)

882-Q. Effect of Geometry on the Properties of C4A-T6 and SG70A-T6 Aluminum-Alloy Castings. W. H. Johnson and H. F. Bishop. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 724-737.

Tensile properties were determined at various locations in aluminum alloy (C4A-T6 and SG70A-T6) castings of different thicknesses and geometries and compared with properties obtained from separately cast test bars. 3 ref. (Q27a, 3-23; Al, 5)

883-Q. Notch and Smooth Bar Stress-Rupture Characteristics of Several Heat-Resistant Alloys in the Temperature Range Between 600 and 1000° F. J. G. Sessler and W. F. Brown, Jr. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 738-755.

Moderately elevated-temperature rupture strength of modified ferritic steels can be considerably increased by heat treating to higher strength levels. However, a practical strength limitation appears to exist in that there is a progressive development of notch rupture sensitivity as the strength level is increased. 10 ref. (Q3q; SGA-h)

884-Q. Influence of Hot-Working Conditions on the High Temperature Properties of Heat-Resistant Alloys. J. F. Ewing and J. W. Freeman. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 756-788.

The relationship between conditions of hot working and properties at high temperatures were investigated for a solution-strengthened 20 Cr, 20 Ni, 20 Co, 3 Mo, 2 W, 1 Cb alloy. Medium to low strengths will result when large reductions are made at nearly constant high temperatures. Very high strengths at 1200° F., and relatively high strengths at 1500° F. are characteristic of gradual reductions over a decreasing temperature range. (Q27a, 2-12, 3-18; SGA-h)

885-Q. Factors Affecting the Forming Properties of Several Copper Alloys in Strip Form. John T. Richards and Ellsworth M. Smith. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 807-822.

Bend, tension and hardness tests were performed on beryllium copper, phosphor bronze, brass, nickel-silver and gilding strip to determine relative forming characteristics. Formability is expressed as the minimum gage radius for cold forming a 90° bend. 5 ref. (Q23q; Cu)

886-Q. Autographic Bearing-Strength Test, and Typical Test Values on Some Magnesium Alloys at Room and Elevated Temperatures. A. A. Moore and J. A. Gusack. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 834-841.

A simplified method of measuring hole elongation in the bearing testing of metals, some of the variables and problems encountered in making a bearing test. Bearing properties of some magnesium alloys at room and elevated temperatures. 6 ref. (Q9, Q27a, 1-4; Mg)

887-Q. Evaluation of Test Variables in the Determination of Shear Strength. Raymond W. Fenn, Jr., and Robert B. Clapper. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 842-858.

Study of extensive new single shear, double shear and punch shear test results reveals a significant size effect which must be considered in any attempt to compare shear strengths of alloys. (Q29, 1-4, 3-23)

888-Q. Creep-Rupture Tests in Shear of Cast Antimony-Lead Alloys. J. Neill Greenwood. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 858-865.

A creep-rupture test has been developed in which a cylindrical pin of the alloy is sheared. The pins were machined from cast bars. Tests have been carried out over a temperature range from 0 to 100° C. on alloys containing up to 11% antimony. A specially refined industrial lead (AAG) was used as the basis of the alloys. (Q3, 1-4; Pb, *Sb*)

889-Q. Fretting Wear of Zircaloy-2 Pellets in High-Temperature Water. L. A. Waldman and P. Cohen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 891-902. (CMA)

Pellet bed reactors using Zircaloy-2 cladding were studied under fully simulated operating conditions. The fretting rate is 4.1 mg. per sq. dm. per month and is not serious with respect to clad integrity or activity levels reached in the primary system. (Q9q, R4, 2-12; Zr)

890-Q. Mechanical Properties of Type-201 Chromium-Nickel-Manganese Stainless Steel Sheet. R. A. Walsh, R. L. Cook and R. A. Lula. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 923-944.

Tensile and compressive properties were determined for two commercial heats of Type-201 sheet with cold reduction from 0 to 60%. (Q27a, Q28g; SS, *Cr, Ni, Mn*)

891-Q. Effect of Size, Shape and Grain Size on the Fatigue Strength of Medium Carbon Steel. Ch. Massonnet. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 954-978.

Experimental data about the size and notch effects, in relation to the improvement of the design of machine parts. 17 ref.
(Q7a, 2-9, 3-23; CN)

892-Q. Fatigue Properties of Comparable Cast and Wrought Steels. E. B. Evans, L. J. Ebert and C. W. Briggs. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 979-1011.

Effect of steel composition and heat treatment; effect of surface finish; directionality; section size effect; mass component. 12 ref.
(Q7a; ST, 4, 5)

893-Q. Effect of Changing Cyclic Modulus on Bending Fatigue Strength. A. A. Blatherwick and B. J. Lazan. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1012-1037.

By means of hypothetical stress-strain locus curves, an anlysis was made of the effect of changing cyclic properties on stress redistribution and its influence on the fatigue life to be expected for various cross-sectional shapes under different loading conditions. 8 ref. (Q7g, Q7b)

894-Q. Fatigue Crack Propagation in Aluminum Alloys. M. S. Hunter and W. G. Fricke, Jr. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1038-1050.

Metallographic observation of fatigue cracks in aluminum alloys from their inception to final complete failure of the specimen has revealed the manner in which fatigue cracks form, propagate and interact. 7 ref. (Q26q, Q7; Al)

895-Q. Notched Fatigue Properties of Some Titanium Alloys. A. W. Demmler, Jr., M. J. Sinnott and L. Thomassen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1051-1062. (CMA)

The rotating-beam fatigue life properties were studied for Ti-75A, RC-130B, RC-A110AT, Ti-6Al and Ti-30Mo. Different shapes and preparations of notches were evaluated. Machined notches decrease the fatigue life properties but not to the predicted extent, ground notches decrease them beyond the predicted extent, and a rolled notch appears to remove any effect of reduced strength from the alloys.
(Q7c, 1-10; Ti)

896-Q. Review of Methods Employed in the Statistical Analysis of Fatigue Data. R. Roeloffs and F. Garofalo. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1081-1090.

Variability in fatigue life at a fixed stress level; determination of endurance limit among nominally identical specimens; empirical fitting of S-N curves and fundamental theories of fatigue failure. 23 ref.
(Q7b, S12)

897-Q. Study of Statical Treatments of Fatigue Data. M. N. Torrey and G. R. Gohn. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1091-1123.

Summarizes results of reversed-bending fatigue tests on two lots of commercial Grade A (5% tin) phosphor bronze strip and presents the observed values (48 values for each deflection level); the distributions of cycle life are fitted by logarithmic-normal, extreme value and log-log normal distributions, showing that the type of distribution depends on the deflection (stress) value. 30 ref. (Q7, S12; Cu-s, 4-3)

898-Q. Wire Fatigue Machine for Investigation of the Influence of Complex Stress Histories. H. T. Corten and G. M. Sinclair. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1124-1137.

Machine operates on the principle of a deflected rotating strut. This equipment was designed to investigate fatigue life for complex stress histories, particularly those consisting of repeated blocks of cycles. The results of constant stress amplitude tests of steel wire are presented and analyzed statistically. (Q7, 1-3)

899-Q. Tests on I-Section Stanchions Bent About the Major Axis. Jacques Heyman. *British Welding Journal,* v. 4, Aug. 1957, p. 373-384.

Tests were made on three lengths of stanchions. Lateral restraint against bending was provided at the top and bottom to simulate effect of secondary beams framing at right angles to the main beams in actual structure. Longest stanchions behaved in a way that was largely elastic, the shortest behaved as stocky struts, while the intermediate lengths presented the greatest problems of analysis. 12 ref.
(Q5g; ST)

900-Q. Low Temperature Properties of Steel Castings. *Castings,* v. 3, June 1957, p. 22-23.

Data on low-temperature impact properties as indicated by Charpy V-notch values for quenched and tempered, plain carbon, low and medium-alloy cast steels.
(Q6n; ST, 5-10)

901-Q. Microporosity in Steel. *Castings,* v. 3, May 1957, p. 25, 27.

Methods for quantitative assessment of microporosity in cast steel and influence of microporosity on mechanical properties.
(Q general, 9-18; ST, 5-10)

902-Q. Hydrogen Absorption, Embrittlement and Fracture of Steel. Arnold E. Schuetz and W. D. Robertson. *Corrosion,* v. 13, July 1957, p. 437t-458t.

Investigation to identify principal cause of failure of alloy steels in corrosive media containing hydrogen sulphide; first part of investigation compared hydrogen sulphide embrittlement with that caused by cathodic charging of hydrogen; investigation of spontaneous fracture under condition of constant deformation as dependent on alloy composition, heat treatment, plastic deformation and chemical environment; hydrogen absorption by iron-nickel alloys from hydrogen sulphide compared to that from sulphuric acid; measured rate of permeation of hydrogen to austenitic, martensitic and ferritic states of iron-nickel alloys. Time dependence of static fracture of iron-nickel alloys as function of applied stress, structure and hydrogen concentration. 43 ref.
(Q26s, R1d, AY, SGA-h)

903-Q. Tensile Properties of Nickel. *Corrosion Prevention and Control,* v. 4, July 1957, p. 42-43.

Effect of temperature on tensile properties of high-purity nickel; tests made at temperatures from −320 to +1500° F. on annealed specimens of 99.85% pure nickel.
(Q27a, 2-11; Ni-a)

904-Q. Fatigue Limits and Size Effect Investigated With Special Reference to Reversed Direct Stress. A. Pasetti. *Fiat Stabilimento Grandi Motori, Technical Bulletin,* v. 9, no. 2, Apr-June 1956, p. 25-38.

Report on a series of tests at the Fiat laboratories. 10 ref. (Q7)

905-Q. Progress in the Development of High-Duty Malleable Cast Iron. Bertil Thyberg. *Foundry Trade Journal,* v. 103, Aug. 22, 1957, p. 213-224.

Production in the Husqvarna concern in Sweden is described, both on laboratory and production scales, together with the effects of carbon, silicon and metallic alloying elements. The application of special heat treatments enabled tensile-strength range to be increased to 24.1-26.6 tons per sq. in. 9 ref.
(Q27a, 2-10; CI-s)

906-Q. Internal Friction of Plastically Deformed Copper. A. S. Darling. *Institute of Metals, Journal,* v. 85, Aug. 1957, p. 489-505.

Investigation of the effect of plastic deformation upon the internal friction of tough-pitch and high-purity copper by means of a torsion pendulum having a low background energy loss. The internal-friction effects induced by plastic deformation can be eliminated from tough-pitch copper, and reduced in high-purity copper, by annealing at 160° C.
(Q22, 3-18; Cu)

907-Q. Role of Atmospheric Oxidation in High Speed Sliding Phenomena. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 835-843.

Influence of load, speed and sample geometry on the extent to which welding and consequent tearing of surfaces of hardened steel (S.A.E. 1095) are prevented in unlubricated high-speed sliding is studied through microscopic examination of surface damage. 26 ref. (Q9p; CN)

908-Q. Metal Transfer in Sliding Contacts. D. G. Flom. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 850-854.

Study of transfer, in sliding contacts, of radioactive silver from silver-graphite riders to rotating cylinders of graphite and of copper. Silver transfer to a copper cylinder is roughly 20-fold greater than to a graphite cylinder. 8 ref.
(Q9p; Ag, Cu)

909-Q. Functional Testing of Cold Reduction Lubricants. J. F. Griffin. *Journal of Metals,* v. 9, Aug. 1957, p. 1042-1043.

Torque test measures film friction properties under a calcuated static million psi. load, simulating the pressure and relative speed between the work roll and the strip.
(Q9p, 1-4; NM-h)

910-Q. Fatigue Failure—A Structure Study. A. A. Krishnan and K. D. Maji. *Journal of Scientific and Industrial Research,* v. 16B, Mar. 1957, p. 105-116.

X-ray diffraction and metallographic techniques in study of crystalline changes in copper subjected to alternate tension and compression in both safe and unsafe ranges.

Results indicate factors responsible for intensification of slip lines, formation of slip striations at fractured stage and breakdown of grains may be responsible for formation of a fatigue crack. 19 ref. (Q7, M27; Cu)

911-Q. New Titanium Alloys. *Light Metal Age,* v. 15, Aug. 1957, p. 36-37. (CMA)

Rem-Cru's Ti-6.5Al-3.75Mo alloy, C-130AMo, has improved hot strength, good time-temperature-stress stability, deep hardenability and good heat treated properties. Data are presented for other mechanical properties such as ultimate tensile and yield strengths, percent elongation, reduction of area, shear strength, fatigue and impact. (Q general; Ti)

912-Q. Mechanical Properties of Iodide Titanium. *Metal Industry,* v. 91, Aug. 16, 1957, p. 134. (CMA)

Russian work on the strength and ductility of iodide titanium is cited. This work consisted of impact bend tests on notched specimens and strength and ductility tests in the range −196-1000° C. It is probable that the structure of titanium can be improved by heating to 1200° C. and hot working and annealing at 700° C. Graphs show the effect of annealing temperature vs. mechanical properties. 6 ref. (Q general, 2-14; Ti)

913-Q. Strain-Ageing as an Explanation of the Knee in the Fatigue Curve of Mild Steel. John C. Levy. *Metallurgia,* v. 56, Aug. 1957, p. 71-73.

Effect of strain-aging on fatigue life. An explanation is offered of the sharp "knee" and well-defined fatigue limit in the S-N curve of mild steel by postulating two such curves —one for the non-strain-aged material and another for the fully strain-aged material. Transformation from one to the other by strain-aging during the test can then produce the "knee" in the curve. 12 ref. (Q7, N7e; SN)

914-Q. Problems of Brittle Fracture. Pt. 4. W. D. Biggs. *Welder,* v. 26, Jan-Mar. 1957, p. 2-7.

General consideration of ductility transition as criterion for brittle fracture; design, material composition and welding practice in relation to probability of initiating and propagating brittle fracture. 10 ref. (Q26s, Q23r)

915-Q. Concept of Creep. E. N. da C. Andrade. Paper from "Creep and Recovery", American Society for Metals, p. 176-198.

Physical distinction between primary, β, and secondary, k, flow; behavior of cubic and hexagonal metals; useful characteristics of shear method; behavior of surface grains; significance of temperature relative to melting point. 33 ref. (Q3)

916-Q. Theory of Creep. Gunther Schoeck. Paper from "Creep and Recovery", American Society for Metals, p. 199-226.

Basic principles of phenomenological aspects of creep; geometrical aspects of plastic deformation; structural details of creep deformation likely to occur under different conditions and characteristic differences between various metals. 71 ref. (Q3, Q24, 10-1)

917-Q. Role of the Boundary in Creep Phenomena. Earl R. Parker and Jack Washburn. Paper from "Creep and Recovery", American Society for Metals, p. 227-250.

Basic mechanism; effects on creep of external surfaces, ordinary grain boundaries, dislocation boundaries, impurities and second phase particles. 34 ref. (Q3, M27f)

918-Q. Discussion of Parker and Washburn Paper on the Role of the Boundary in Creep Phenomena. Ray W. Guard. Paper from "Creep and Recovery", American Society for Metals, p. 251-254.

Metallographic observations of geometrical etch pit patterns observed on creep specimens of polycrystalline nickel which indicate three important aspects of polygonization during creep. 2 ref. (Q3, M27f)

919-Q. Spectrum of Activation Energies for Creep. John E. Dorn. Paper from "Creep and Recovery", American Society for Metals, p. 255-283.

Activation energies for high-temperature creep, for grain-boundary shearing and for self-diffusion. Structural changes in high-temperature creep; effect of stress on creep rate and theories of creep. 34 ref. (Q3, P13a, N1d)

920-Q. Creep and Fracture. Nicholas J. Grant and Arup R. Chaudhuri. Paper from "Creep and Recovery", American Society for Metals, p. 284-343.

Processes of deformation and structural changes during creep; types of fracture and effects of metallurgical variables and conditions of deformation on fracture. 91 ref. (Q3, Q27)

921-Q. Creep of Crystalline Nonmetals. J. B. Wachtman, Jr. Paper from "Creep and Recovery", American Society for Metals, p. 344-360.

Creep of single crystal and polycrystalline ceramic oxides. Available data indicate that creep occurs at much higher temperatures in oxide ceramics than in metals and with the same complexity of behavior. 24 ref. (Q3; 6-20)

922-Q. Effect of Differences in Ductility on Fracture Patterns. F. P. Rybalko. *Fizika Metallov i Metallovedenie,* v. 3, no. 1, 1956, p. 185-186. (*Henry Brutcher Translation* no. 3923.)

Changes in ductility (induced by tempering of quenched and polished 0.45% C, 0.9 Cr, 1.65 Ni, 0.25 Mo, 0.15 V steel cylinders) in relation to appearance of their (tensile) fracture surfaces; classification and description of fracture patterns; observation of ordered arrangement of protrusions on fracture faces; stress states from which the fracture patterns observed result. (Q26, Q23p)

923-Q. (French.) **Relation Between the Nature of Plastic Deformation in Aluminum and the Appearance of Laue Spots.** Michel Wintenberger. *Comptes Rendus,* v. 244, May 27, 1957, p. 2716-2718.

Direction of grooves in Laue spots corresponds to orientation of slip lines. Also, number of grooves per spot, about 10, corresponds to number of slip bands observed micrographically in region irradiated by X-rays. This striation is due to the fact that plastic deformation is produced only along slip planes. (Q24a; Al)

924-Q. (French.) **Contribution to the Study of the Influence of Slight Additions of Alloying Elements to a Chromium-Manganese-Silicon Steel.** F. Maratray and G. Delbart. Institut de Recherches de la Siderurgie, Publications, Ser. A, no. 151, Feb. 1957, p. 1-35. (Reprinted from *Revue de Metallurgie,* v. 53, Nov. 1956, p. 849-883.)

Attempt was made to improve Cr-Si-Mn base steel by adding molybdenum, vanadium, boron and other elements which normally accompany such additions, such as aluminum and titanium, and to determine results on hardenability, temper brittleness and mechanical properties in general. 8 ref. (Q general, J5, 2-10; AY)

925-Q. (French.) **Relation Between Permanent Deformation in a Simple Tensile Test and the Flow of Steels at Ordinary Temperature.** Kazimierz Gamski. *University of Liege, Centre d'Etudes de Recherches et d'Essais Scientifiques du Genie Civil, Bulletin,* v. 8, 1956, p. 171-291.

Experiments conducted over a period of several years provide basis for formula for estimating cold flow after, say, 1000 hr., and under given stress, on basis of instantaneous permanent deformation resulting from simple tensile test with same load. 89 ref. (Q27, Q24; ST)

926-Q. (German.) **Hardening Carbon Steel by Deformation.** Friedrich Erdmann-Jesnitzer and Gunther Häusster. *Neue Hutte,* v. 2, July 1957, p. 409-417.

Curves for Brinell and microhardness following cold forming; notched-bar impact test curves; influence of type of deformation (stretching, twisting); recrystallization retardation and recrystallization anomalies. 35 ref. (Q23a, Q29a; CN)

927-Q. (Japanese.) **Characteristics of Work Hardening and Anneal Softening of Titanium-Base Ti-Al Alloy Wires.** Y. Yagi. *Japan Institute of Metals, Journal,* v. 21, May 1957, p. 360-363. (CMA)

Microstructures and work hardening of titanium and Ti-Al alloys (1-4%) were investigated. Cold drawn specimens showed less twinning and work hardening for the alloys than for the metal. When annealing 56% reduced wire for 1 hr., the beginning temperatures of recrystallization were 500, 575, 600-650 and 650-700° C. for titanium, Ti-1Al, Ti–2Al and Ti-4Al, respectively. (Q24, J23, M27; Ti)

928-Q. (Japanese.) **Effect of Elastic Strain on Stress Distribution at the Neck of Tension Test Specimen.** Ishibashi. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 444-447.

Effect of elastic strain around the neck of test specimens was analyzed; relationship between radial and circumferential stress discussed. 5 ref. (Q27h)

929-Q. (Japanese.) **Effect of Repeated Bending Stress on the Hardness of Low-Carbon Steel.** Fenji Ando and Sadasi Nishio. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 495-499.

Micro-Vickers hardness tests at 50-g. and 1000-g. loads; microstructure and heat treatment effect on bending stress. 10 ref. (Q29a, Q5g; CN)

930-Q. (Japanese.) **6th Report. Some Effects in Shore Hardness Number on the Distance Between Impact Indentations. 7th Report. Effect of Inclination.** Shuro Macida. *Japan Society of Mechanical Engineer, Transactions,* v. 23, July 1957, p. 506-518.

The effect of the distance between impact indentations made by the diamond hammer of the Shore scleroscope. (Q29c)

931-Q. (Japanese.) **Relation Between Percent Elongation and Reduction of Area in Tension Tests.** Tatuzi Simigu and Masatosi Ide. *Japan Society of Mechanical Engineer, Transactions,* v. 23, July 1957, p. 518-522.

New equations expressing the relation betwen elongation and reduction of area, general concentration being considered in addition to minimum concentration. (Q27)

932-Q. (Russian.) **Brittleness of Welded Joints in Titanium Caused by Hydrogen.** S. M. Gurevich. *Metallovedenie i Obrabotka Mietallov,* No. 6, June 1957, p. 47-50. (CMA)

Examination of mechanical properties of welds in titanium containing 0.01-0.05% H showed that, while the impact strength is considerably lowered, the tensile strength (for hydrogen contents above 0.03%) is somewhat increased. The introduction of metals (like aluminum and tin) which stabilize the monophase structure of titanium does not remove the brittleness caused by hydrogen. However, the addition of elements (like molybdenum) which stabilize the beta-phase of titanium does prevent hydrogen brittleness of welds. 11 ref. (Q26s; Ti, *H*, 7-1)

933-Q. (Spanish.) **Mechanical Properties of Metals.** *Fusion de Metales,* v. 19, May-June, 1957, p. 17-20.

Tensile strength and means of testing; calculation of ultimate tensile strength. (To be continued.) (Q27, 1-4)

934-Q. (Spanish.) **Fatigue and Design Considerations in Welded Naval Construction.** Z. Garcia Martin. *Ciencia y Tecnica de la Soldadura,* v. 7, May-June 1957, 18 p.

General review of fatigue fracture, mechanical characteristics of metals subjected to static and dynamic loads, permissible stress and safety factor, nominal stress and notch effects in welded joints, distribution of stresses, design recommendations, importance of shape of structure, behavior of riveted and welded structures, fatigue strength of butt welds. 5 ref. (Q7a, T22g; 7-1, 17-1)

935-Q. (Book.) **Creep and Recovery.** 372 p. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $6.

Papers presented at Seminar held during National Metal Congress and Exposition, October 1956, cover various aspects of recovery; interaction of dislocations and vacancies and grain boundary behavior in creep of crystalline metals; and creep of crystalline nonmetals. Papers separately abstracted. (Q3, N4)

936-Q. (Book.) **Effect of Residual Elements on the Properties of Metals.** 217 p. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $4.

Five lectures presented during the National Metal Congress and Exposition, Cleveland, Oct. 8-12, 1956. Papers abstracted separately. (Q general, M general, P general, 2-10)

937-Q. (Book.) **American Society for Testing Materials, Proceedings, v. 56.** 1956. 1497 p. A.S.T.M., 1916 Race St., Philadelphia 3, Pa.

Technical papers, except for those previously covered, are abstracted separately. (Q general)

R Corrosion

330-R. Controlled Moisture Condensation Apparatus for Evaluation of Rust-Preventive Oils. H. Roden. *ASTM Bulletin,* no. 223, July 1957, p. 55-61.

Test with closed cell, high-humidity, moisture condensation apparatus which provides specific temperature differences between humid ambient air and steel surface indicates test is fast and reproducible. (R10b, R11)

331-R. Failure of Steel-Admiralty Duplex Condenser Tubes by Hydrogen Penetration. H. E. Honkala and E. A. Wright. *Corrosion,* v. 13, Aug. 1957, p. 501t-504t.

Tubes exposed to hydrogen sulphide and sufficient pressure between outer and inner tube to cause the liners to collapse, failed within four weeks. Pressure build-up rate of a "volumeless" cell in various corrosive atmospheres was studied. 8 ref. (R7k, T29n; ST, Cu)

332-R. Cathodic Protection of Oil Well Casings at Kettleman Hills, Calif. James K. Ballou and Fred W. Schremp. *Corrosion,* v. 13, Aug. 1957, p. 507t-514t.

Surface potential and casing potential profile measurements. Tests showed cathodic protection is a practical method to at least 8000-ft. depths, provided sufficient current is used. 13 ref. (R10d, T28)

333-R. Cathodic Protection of an Active Ship Using Zinc Anodes. B. H. Tytell and H. S. Preiser. *Corrosion,* v. 13, Aug. 1957, p. 515t-518t.

High-purity zinc conforming to MIL-A-18001 provided excellent protection. Hull potential readings both underway and at rest were obtained continually during the 15 months of investigation. Condition of tug's bottom was excellent and distribution of current was effective. 4 ref. (R10d, T22g; Zn, 17-7)

334-R. Some Aspects of the Corrosion Processes of Iron, Copper and Aluminum in Ethylene Glycol Coolant Fluids. P. F. Thompson and K. F. Lorking. *Corrosion,* v. 13, Aug. 1957, p. 531t-535t.

Effect on corrosion of iron, copper and alumnum of triethanolamine phosphate. Corrosion properties of the three metals in glycol and water-glycol mixtures are similar to those in pure water. 16 ref. (R7; Fe, Cu, Al)

335-R. Chloride and Caustic Stress Corrosion of Austenitic Stainless Steel in Hot Water and Steam. W. Lee Williams. *Corrosion,* v. 13, Aug. 1957, p. 539t-545t.

Definition of environmental factors which govern stress-corrosion behavior in steam-water systems and possible means for control. 16 ref. (R1d, R4d; SS-e)

336-R. Nickel-Lined Steel Vessels for Caustic Service. J. L. Weis. *Industrial and Engineering Chemistry,* v. 49, June 1957, p. 69A-70A.

Restoration of cracked vessels. Problems in nickel lining procedure including lining thickness, welding, etc. (R6j; Ni)

337-R. Corrosion of Single Crystals and Recrystallized Single Crystals of Iron and Steel in Citric Acid. W. Roger Buck III, and Henry Leidheiser, Jr. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 474-481.

Studies on polycrystalline disks and monocrystalline spheres and disks of Armco iron and type-L steel in 0.2N citric acid at 20° C. and boiling point. Results of seven different types of experiments indicate that the (100) face corrodes at a slower rate than minor faces such as (321). 15 ref. (R6g; Fe, ST, 14-11)

338-R. Corrosion and Cathodic Protection. H. V. Beezley and G. R. Olson. *Petroleum Engineer,* v. 29, June 1957, p. D28-D34.

Causes of corrosion, and control in pipeline systems by coatings, extra metal thickness and cathodic protection. Sources of electricity in cathodic protection. (R10d)

339-R. Accelerated Corrosion Tests for the Performance of Plated Coatings. Walter L. Pinner. *Plating,* v. 44, July 1957, p. 763-766.

Definition of acetic acid spray test and Corrodkote test for testing out-of-door durability of chromium plated steel and zinc alloy parts. (R11; *Cr,* 8-12)

340-R. Case Histroy on Cathodic Protection. *Steel,* v. 141, Aug. 12, 1957, p. 128-129.

Note on corrosion in underground piping systems and protection with anode and rectifier system. (R10d)

341-R. (French.) **Surface Flow Phenomena in the Course of High-Temperature Oxidation. The Case of Zirconium and Its Alloys.** D. Whitwham, J. Boghen and J. Hérenguel. *Revue de l'Aluminium,* v. 34, June 1957, p. 611-623. (CMA)

The oxidation of zirconium was studied in air in the temperature range 400-1050° C. for time intervals ranging up to 24 hr. It was found that below 500° C. a thin, compact oxide film adheres to and protects the metal. Above 500° C. the metal below the surface undergoes a real transformation due to the expansion which takes place during the conversion of the metal into its oxide. 9 ref. (R1h, 2-12; Zr)

342-R. (German.) **Electrochemical Processes in Stress-Corrosion.** H. Gerischer. *Werkstoffe und Korrosion,* v. 8, July 1957, p. 394-401.

The narrow localization of the corrosion process is caused by the mechanism of plastic deformation. Under plastic deformation the atoms on the lines of the slip planes or on slipping grain boundaries along the surface will be activated and dissolved favorably. As a result, protective coatings are formed on the surface of all alloys susceptible to stress-corrosion. Cracking of these covers under plastic deformation increases the localization of the corrosion process and causes the phenomenon of tension crack corrosion. 19 ref. (R1d, Q24)

343-R. (German.) **Description of the Corrosion Behavior of Aluminum and Its Alloys in Electrolytes by Means of Corrosion Current pH Value Diagram.** T. Markovic and M. Balasa.

Werkstoffe und Korrosion, v. 8, July 1957, p. 402-405.

The corrosion currents of 99.5% pure aluminum and the aluminum alloys with 0.69, 1.6, 4.6% Mg. were calculated from the discontinuities of the anodic and cathodic polarization curves with initial pH values known and were transferred into the customary corrosion equivalent of g. per sq. m. per day. 19 ref. (R11m; Al)

344-R. (Japanese.) **Corrosion and Prevention of Corrosion.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 619-624.

Theory and mechanism of corrosion, dry corrosion and the phenomenon of passivation; examples of prevention of cathodic corrosion; corrosion tests and corrosion inhibitors. (R10, R11)

345-R. (Japanese.) **Corrosion of Metals in Atomic Reactors.** Goro Ito. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 148-156.

Corrosion of metals by high-temperature water in atomic reactors; corrosion resistance of stainless steel, zirconium-tin alloys and carbon steel; corrosive effects of uranium, uranium salts, molten metals and bismuth. 35 ref.
(R general, W11p, 17-7)

346-R. Prevention of Corrosive Cracking of Brass Liquid Fuel Manifolds. A. V. Shreider. *Journal of Applied Chemistry of the USSR,* v. 29, July 1956, p. 1133-1142. (Translated by Consultants Bureau, Inc.)

Cause of corrosive cracking; effectiveness of cadmium plating; comparison of brass versus cupronickel manifolds. 28 ref.
(R1d; Cu-n, *Cd*)

347-R. Processes of Film Formation and Destruction in Cathodic Protection of Steel in Sea Water. I. B. Ulanovsky. *Journal of Applied Chemistry of the USSR,* v. 29, July 1956, p. 1143-1148. (Translated by Consultants Bureau, Inc.)

Chemical composition of cathodic films and solubility product of components; conditions for equilibrium between precipitates and sea water. 13 ref. (R4b, R10d; ST)

348-R. Anti-Corrosion Treatment of Zinc Coatings. N. A. Solovyer. *Journal of Applied Chemistry in the USSR,* v. 29, July 1956, p. 1149-1152. (Translated by Consultants Bureau, Inc.)

Treatment of zinc-coated surfaces in a solution of chromic, sulphuric and hydrochloric acids produced 8 to 10-fold increase in corrosion resistance, as shown by corrosion chamber tests, prolonged storage and factory trials. 4 ref. (R10c; *Zn,* 8)

349-R. Passivity of Titanium in Hydrochloric Acid Solution. R. Otsuka. *Tokyo, Scientific Research Institute, Journal,* v. 51, June 1957, p. 73-74. (CMA)

The passivity of titanium in hydrochloric acid solutions is attributed to hydride formation which is passivated on exposure to air. The passive state thus obtained was unstable but could be insured by immersion in nitric acid solution. Potassium chloride solution was also helpful. The corrosion loss difference between passivated and unpassivated specimens corresponds to the times required to destroy the passivity of titanium and TiH. The passive state on the latter is the more stable. (R10c; Ti)

350-R. Report of the May 1954 Meeting of the Zirconium Alloy Corrosion Committee. S. Kass. *U. S. Atomic Energy Commission,* WAPD-MM-448, June 1, 1954, 115 p. (CMA)

Results of research by member organizations on Zircaloy-3 development, feasibility of less tin in Zircaloy-2, effects of varying iron and nitrogen in Zircaloy-2, effects of cold reduction and annealing on zirconium corrosion resistance and plans for future research.
(R general; Zr)

351-R. Aqueous Corrosion of Zirconium and Its Alloys At Elevated Temperatures. D. E. Thomas. *U. S. Atomic Energy Commission,* WAPD-T-254, 20 p. (CMA)

A study of the kinetics of zirconium corrosion in hot water resulted in an empirical relationship between weight gain per area and a power of time (0.5-1.0). The effect of temperature shows itself in the size of the time coefficient. The effects of impurities are mainly harmful, this being true of nitrogen especially. Alloying to overcome "breakaway" was studied. Tin is the best addition for overcoming impurity effects. The Zircaloy-2 composition is considered very favorably. 11 ref. (R4, 2-12; Zr)

352-R. Corrosion Evaluation of Binary Uranium Alloys in Water at 100° C. H. A. Saller, H. A. Pray, R. F. Dickerson, W. E. Berry and E. L. Foster, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-971, Dec. 27, 1954, 37 p.

Additions ranging from 2 to 12 at. % of some 42 elements and effect of heat treatment on corrosion resistance were investigated. Melting characteristics, fabrication temperatures, and heat treatment temperatures for each alloy were noted. Vickers hardness numbers of all alloys and data on grain size of the more corrosion resistant alloys were also obtained. 17 ref.
(R4, 2-12, 2-10, 2-14; U)

353-R. Crevice Corrosion of Uranium and Uranium Alloys. J. W. Frank and A. H. Roebuck. Argonne National Laboratory, *U. S. Atomic Energy Commission,* ANL-5380, Mar. 1955, 390 p.

Corrosion of uranium in high-temperature (500° F.) water; capsule experiments, bonded plate-pinhole experiments and gaseous hydriding experiments are described. 17 ref. (R1b, R4, 2-12; U)

354-R. Corrosion of Materials in the Presence of Fluorine at Elevated Temperatures. M. J. Steindler and R. C. Vogel. Argonne National Laboratory, *U. S. Atomic Energy Commission,* ANL-5662, Jan. 1957, 21 p.

Data indicated that nickel and Monel were suitable materials for use in a fluorine atmosphere at temperatures up to 550° C. At higher temperatures nickel and copper exhibited the lowest corrosion rates. Ceramic materials such as calcium fluoride and alumina were resistant to attack by fluorine even at the highest temperatures, but lacked mechanical strength. (R6, 2-12)

355-R. Corrosion of Aluminum in High-Temperature Water. Pt. 2. Application of Infrared Spectra to Corrosion Studies. R. M. Haag. General Electric Co., *U. S. Atomic Energy Commission,* KAPL-1739, Feb. 28, 1957, 19 p. (Available from U. S. Office of Technical Services, $.20.)

The application of infrared transmission measurements to corrosion studies has been investigated. Corrosion products may be identified in situ by reflectance measurements, or after removal from the base metal. (R4, 2-12; Al)

356-R. Corrosion Properties of Various Materials in High-Temperature Waters. C. J. Lancaster and W. L. Williams. Naval Engineering Experiment Station. *U. S. Office of Technical Services,* PB 111963, Jan. 1953, 22 p. 75¢.

Prestressed Inconel and Type-302 stainless steel coil springs and prestressed Type-347 steel showed no evidence of intergranular or stress-corrosion failure when tested in 500° degassed distilled water and 470° F. synthetic boiler feed water, respectively. On the other hand, dynamic stress-corrosion tests on chromium plated K-Monel, Armco 17-14, 17-4, SS-310, 322 and 347 stainless steels, 90-10 and 70-30 copper-nickel alloys, Easy-Flo silver brazing alloy on Type 304 steel, and Navy No. 2 babbitt indicated varying degrees of corrosion in 500° F. oxygenated water. (R4, 2-12; SS)

357-R. Investigation of Intergranular Oxidation in Stainless Steels and High-Nickel Alloys. C. A. Siebert, et al. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121795, Oct. 1956, 53 p. $1.50.

With some alloys, oxidation occurs in the grain boundaries ahead of the metal-oxide interface. In tests, intergranular penetrations increased rapidly with stress after a certain minimum value was reached. This minimum value, or threshold stress, was determined for several alloys at various temperatures, along with the weight gained during oxidation. Among the results, it was found that most of the alloys followed the parabolic oxidation law. (R1h; SS, Ni)

358-R. Effect of Structure of Lead Upon Its Corrosion in Sulphuric Acid. M. A. Dasoyan. *Doklady Akademii Nauk SSSR,* v. 107, no. 6, 1956, p. 863-866. (*Henry Brutcher Translation* no. 3940.)

Previously abstracted from original. See item 345-R, 1956. (R6g; Pb)

359-R. (German.) **Study of Oxide Layers on Cast Iron and Aluminium.** Anton Königer. *Giesserei,* v. 44, Aug. 1, 1957, p. 457-461.

Examination of the effect of the skin or oxide scale on the mechanism of corrosion; gases as the source of swelling within the skin; effect of local corrosion at the surface on the formation of blowholes; prerequisites of the formation of a dense oxide skin; fundamental differences in the corrosion behavior of cast iron and aluminum. 6 ref.
(R1h; CI, Al)

360-R. (Italian.) **Some Aspects of Hull Corrosion in Vessels Under Construction.** Biaggio Ruggiero. *Rivista Italiana della Saldatura,* v. 9, Mar-Apr. 1957, p. 69-72.

Electrochemical phenomena which cause hull corrosion, especially those originating in on-board welding operations performed with d.c. and basic electrodes, or with electrode connected to positive pole of gener-

ator; recommended precautions with reference to working conditions, welding equipment and mooring of vessels. (R1j, K1, T22g)

361-R. (Italian.) **Corrosion in a Marine Atmosphere.** Giampaolo Bolognesi. *Rivista di Meccanica,* no. 159, Apr. 13, 1957, p. 13-16.

Special problems of large installations where frequent anticorrosion treatments are costly or otherwise not readily executed; case of specialized installations, such as oil company docks, where marine medium is altered by other substances. Pitting, effect of scale left by rolling operations, corrosion effects of tide and mud, corrosion of welded parts. (R4b, R3p)

362-R. (Japanese.) **Corrosion of Cast Iron by Sulphur.** Yoh Serita. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 257-258.

Prevention of corrosion by sulphur by adding chromium, manganese, vanadium and aluminum to cast iron.
(R7k, 2-10; CI-q, *Cr, Mn, V, Al*)

363-R. (Japanese.) **Corrosion of Chemically Polished Stainless Steel.** Maro. *Chemical Society of Japan, Journal,* v. 60, June 1957, p. 680-683.

Corrosion tests on electrically polished, chemically polished and mechanically polished stainless steel. Corrosion was greatest in the electrically polished samples.
(R general, L10b, L12f, L13p; SS)

364-R. Corrosion Resistance of Metals and Alloys to Sodium and Lithium. E. E. Hoffman and W. D. Manly. Paper "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 82-91.

Comparison of the corrosion resistance of various metals and alloys in these liquid metals at elevated temperatures. The principal variables which affect the extent and form of corrosion are temperature, time, temperature differentials in the system, and purity of the liquid metal. 5 ref.
(R6m, 2-11; *Na, Li*)

365-R. Intergranular Corosion Resistance of Low-Carbon Austentic Chromium-Manganese-Nickel Steels. W. O. Binder, J. Thompson and C. R. Bishop. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 903-922.

The austenitic chromium-manganese-nickel steels become susceptible to intergranular corrosion when heated in the temperature range of 425 to 815° C. The immunization of these steels with columbium or titanium introduces metallurgical complications, and in view of this, the possibility of gaining control of intergranular corrosion by lowering carbon was investigated. 4 ref.
(R2h, 2-10; SS)

366-R. Corrosion of Metals in Buildings. F. E. Jones. *Chemistry and Industry,* v. 76, Aug. 3, 1957, p. 1050-1063.

Service conditions described and applications of lead, copper, zinc and aluminum enumerated. 11 ref.
(R3, T26n, 17-7; Pb, Cu, Zn, Al)

367-R. Corrosion in Light Oil Storage Tanks. E. H. Tandy. *Corrosion,* v. 13, July 1957, p. 427t-432t.

Factors governing corrosion rates in steel storage tanks are solubility of oxygen in oil, rate of movement of oil, type of roof, vapor pressure and climatic conditions; data on relationship between size, location of tanks, stocks contained and corrosion rate; considers corrosion mechanism and control measures. 9 ref.
(R7e; ST)

368-R. Corrosion of Iron in High-Temperature Water. Pt. 2. Kirkendall Experiments. D. L. Douglas and F. C. Zyzes. *Corrosion,* v. 13, July 1957, p. 433t-436t.

Kirkendall type of experiments using an oxide of radioactive nickel as marker carried out to identify ion species diffusing through magnetite film formed on corrosion of iron in water with temperature range of 240 to 360° C.; evidence indicates diffusion of iron ion outward from metal to water interface. 8 ref.
(R4, 2-12; Fe)

369-R. Cathodic Protection of Internals of Ships. L. P. Sudrabin. *Corrosion,* v. 13, July 1957, p. 466t-472t.

In formation on cathodic protection of internal steel tanks used for sea water ballast including design and application of protective current and protection achieved with magnesium anodes. 11 ref.
(R10d; ST)

370-R. Progress in Prevention of Corrosion in Naval Aircraft. S. L. Chisholm and N. N. Rudd. *Corrosion,* v. 13, July 1957, p. 473t-480t.

Techniques developed by Navy for long-time protection of aircraft components; protection of magnesium alloys with pigmented silicone, resin coatings, and results obtained with thixotropic preservation formulations and vapor inhibitors in preventing cylinder wall corrosion in reconditioned aircraft engines. 29 ref. (R10b, L general, T24b)

371-R. Performance of Alcan 65S-T6 Aluminum Alloy Embedded in Certain Woods Under Marine Conditions. T. E. Wright, H. P. Godard and I. H. Jenks. *Corrosion,* v. 13, July 1957, p. 481t-487t.

Laboratory and marine exposure tests carried out to assess performance of Alcan 65S-T6 aluminum alloy embedded in certain woods under marine exposure conditions. 3 ref.
(R4b; Al)

372-R. Science of Corrosion. J. M. Kape. *Corrosion Prevention and Control,* v. 4, July 1957, p. 37-41, 52.

Review of fundamental chemical changes and reactions occurring at anode and cathode of corrosion cells. 14 ref. (R1)

373-R. Corrosion Research—Corrosion of Metals Group of the Chemical Research Laboratory. *Corrosion Prevention and Control,* v. 4, July 1957, p. 49-52.

Measuring chromium uptake on steel specimens immersed in chromate solution containing radioactive chromium ions; electrode potential of various metals in solutions of ethylene glycol and other corrosion inhibitors; influence of copper content and pH of water on pitting in mild steel boiler tubes. 4 ref.
(R11, A9h; ST)

374-R. Corrosion and Iron Oxide Deposition Associated With Steam Power Stations. *Edison Electric Institute Bulletin,* v. 25, May 1957, p. 147-148.

Battelle research program determining solubility product and rate of decomposition of ferrous hydroxide over a range of temperatures and calculation of free energies and heats of reactions involved in corrosion. (R4d; ST)

375-R. Kesternich Corrosion Test. *Electroplating and Metal Finishing,* v. 10, May 1957, p. 157.

Note on rapid test developed in Germany for measuring accelerated corrosion by atmosphere. (R11q)

376-R. Researches on Corrosion and Inhibition Adsorption, Inhibition and the Langmuir Equation. George S. Gardner. *Franklin Institute, Journal,* v. 263, June 1957, p. 523-535.

Corrosion velocity of steel in dilute acetic acid, in the presence of an oil phase, and in the presence and absence of an organic inhibitor. 7 ref. (R1, R10b; ST)

377-R. Events at a Scratch-Line. Fourth Hothersall Memorial Lecture. U. R. Evans. *Institute of Metal Finishing, Bulletin,* v. 7, no. 2, Summer 1957, p. 139-166.

Effects of scratches in metal surfaces on corrosion; reviews information on iron, nickel, zinc, aluminum, titanium, and zirconium. Data on probability of corrosion at scratch-line with relationships to period of air exposure, proximity of neighboring scratch, electrical current flowing between scratch and surrounding region and internal stresses formed by scratching; considers stress situation on metals oxidized by inward movement of oxygen through film and those oxidized by outward movement of metal ions. 34 ref.
(R1d, R1j; Fe, Ni, Zn, Al, Ti, Zr)

378-R. Cathodic Protection in Relation to Ships' Bottom Paints. H. W. Van der Hoeven. *Oil and Colour Chemists' Assoc. Journal,* v. 40, Aug. 1957, p. 667-683.

Behavior of ships' hull paint systems under cathodic protective conditions. Best results obtained with vinyls or with coated anodes shaped to expose increasing anode surface. 13 ref. (R10d, T22g; 8-20)

379-R. How to Combat Corrosion From High-Sulphur Residual Fuel Oils. J. L. Philips and C. A. Weisel. *Marine Engineering Log,* v. 62, June 1957, p. 93-94, 166.

Cylinder lubricant for marine diesel engines which reduces cylinder wear and neutralizes sulphurous combustion products, thereby reducing corrosion. (R7d)

380-R. Rust. *Railway Age,* v. 143, Aug. 19, 1957, p. 18-22.

Use of corrosion resistant materials and paint.
(R general, T23, 17-7; L26n)

381-R. (French.) **Corrosion of Lead Casings of Underground Electric Cables.** J. C. Senez and F. Pichinoty. *Corrosion et Anticorrosion,* v. 5, July-Aug. 1957, p. 203-209.

Tests on cables, some of which had been buried for long periods, others of which were still in warehouses, showed that white corrosion of lead casings was caused by attack of volatile fatty acids present in the form of esters in raw jute used to pack cables. These esters result from incomplete retting of the jute fibers and are hydrolyzed by pectinolytic bacteria. A sample of cable with paper packing instead of jute revealed no corrosion. 11 ref.
(R8, T1b, 17-7; Pb)

382-R. (French.) **Influence of Inhibitors on Ratio Between Adsorbed Hydrogen and Released Hydrogen in Corrosion of Iron in an Acid Medium.** Giampaolo Bolognesi and Liliana Felloni. *Corrosion et Anticorrosion,* v. 5, July-Aug. 1957, p. 210-215.

Action of three typical inhibitors (OTT, ISOT, PTOL) on speed of dissolution of Armco iron in HCl was studied by gasometric measurement of released hydrogen and colorimetric measurement of iron in solution. Since quantity of adsorbed hydrogen was quite large, measurements of volume of released hydrogen could not provide a precise evaluation of inhibiting power, particularly when readings were made after a brief delay. Choice of an inhibitor should depend largely on quantity of adsorbed oxygen. 19 ref. (R10b, R6g; Fe, *H*)

383-R. (French.) **Corrosion Protection for Industrial Steam Producing and Utilizing Installations. Pt. 2. How to Guarantee Protection of Equipment.** R. Malicet. *Corrosion et Anticorrosion,* v. 5, July-Aug. 1957, p. 216-220.

Types of corrosion encountered in different elements of steam installations; supply water and boiler water make-up, rate of vaporization and generator design as factors causing internal corrosion of piping; importance of correct operation of steam equipment by qualified personnel. (R4d)

384-R. (French.) **Report of Work of Commission on Marine Corrosion of A.B.E.M. (Belgian Society for Study, Testing and Use of Materials.)** J. Depireux. *Industrie Chimique Belge,* v. 22, Apr. 1957, p. 379-392.

Specimens of steel were immersed for 16 months in Port of Ostend prior to tests designed to show: (1) influence of surface conditions on behavior of a typical paint applied with or without wash-primer; (2) influence of time elapsing between application of wash-primer and of paint; (3) behavior of different wash-primers for a given prepared surface and a given paint.
(R4b; ST, 8-20)

385-R. (Italian.) **Influence of Surface Preparation of Steel on Behavior of High Zinc Content Paints.** G. Binetti and G. C. Ghisolfi. *Metallurgia Italiana,* v. 49, May 1957, p. 327-332.

Electrochemical nature of iron corrosion; zinc as an anodic inhibitor; removal of mill scale; prepainting of surfaces. Experiments and results. (R10b, L26n; ST, 8-20)

386-R. (Italian.) **Sodium Polyphosphates and Their Use as Corrosion Inhibitors.** A. Indelli. *Metallurgia Italiana,* v. 49, May 1957, p. 33-336.

Physical properties and characteristics of sodium phosphates; description of their operation to prevent corrosion. Attempt at logical and coherent interpretation of their inhibiting action can be made on basis of different possible types of cathodic corrosion reaction and of surface activity characteristics of the compounds derived from these salts. 33 ref. (R10b)

387-R. (Italian.) **Control of Bituminous Coverings of Pipe Destined for Underground Installation.** F. Baldi. *Metallurgia Italiana,* v. 49, May 1957, p. 337-340.

Details of conductometric test adopted at "Centro Ricerche e Controlli Falck"; actual service conditions of pipe are duplicated in tests to determine covering requirements to prevent corrosion, especially that resulting from stray electric currents. Test method has application in production process. 33 ref.
(R8, L26a; 4-10)

388-R. (Italian.) **Thermal Balance Used for Oxidation Tests on Cast Irons Containing Al and Cr.** N. Collari and E. Hugony. *Metallurgia Italiana,* v. 49, May 1957, p. 341-348.

Test pieces were heated in air at 800° C. for as long as 3 hr. In normal or low-alloy cast irons, white Al-Cr cast iron, and a heat resistant chromium steel which was tested for purposes of comparison, an increase in weight was noted. In gray (graphitic) cast irons containing aluminum, a decrease in weight was noted, due to surface oxidation of carbon. Aluminum, under given test conditions, provided a higher resistance to heat than chromium. 9 ref. (R1h, 1-4; CI-q, *Al, Cr*)

389-R. (Italian.) **Some Inhibitors of Aluminum Corrosion. Pt. 1. Acid Medium in Presence of Tannic Acid and Rosin.** G. DeAngelis and V. Carunchio. *Metallurgia Italiana,* v. 49, May 1957, p. 349-354.

Specimens of 99% aluminum were immersed in hydrochloric acid. Both tannic acid and rosin showed good inhibiting properties, providing about 99% protection in strongest solutions. Study was carried out by measuring loss of weight, reaction potential, surface tension and pH. 31 ref. (R10b, R6g; Al)

390-R. (Italian.) **Oxidation Behavior of Metals and Alloys in the Molten State.** P. Spinedi. *Metallurgia Italiana,* v. 49, May 1957, p. 363-370.

Lead, cadmium, tin and zinc were subjected to hot oxidation; behavior in both solid and liquid phases was studied, with emphasis on latter. Binary alloys of these metals were then studied to determine influence exerted on their oxidation behavior by varying concentrations of components. Simple eutectic diagrams, were studied. as well as influence on oxidation behavior of intermetallic compounds (cadmium-copper diagram) and by superlattices (cadmium-magnesium diagram). Analogies between oxidation - concentration curves obtained and those reported in recent studies on viscosity, castability, surface tension, etc., in relation to concentration. 40 ref.
(R1h, 2-10; Pb, Cd, Sn, Zn, 14-10)

391-R. (Italian.) **Iron Corrosion and Boiler Water Treatment.** T. Songa. *Metallurgia Italiana,* v. 49, May 1957, p. 371-376.

Corrosion of iron in aqueous media; formation of a protective layer on iron by action of boiling water; influence of oxygen and alkalis; problem of copper in boiler water; caustic corrosion in boilers; corrosion preventives as established by experiments at Breda Institute, specialists in water treatment. 30 ref. (R4c, R10a; Fe)

392-R. (Japanese.) **Corrosion Fatigue of Steel Wire.** Endo Kichiro, Hiroyasu Huji and Shunji Omori. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 484-488.

Corrosion fatigue of 0.75% carbon steel, annealed and cold worked, in relation to residual stress.
(R1e, Q25h, CN, 4-11)

393-R. (Polish.) **Anodic Behavior of Metals. Pt. 4. Copper in NaOH Solutions.** Zdzislaw Zembura. *Roczniki Chemii,* v. 31, no. 2, 1957, p. 627-635.

An attempt to elucidate the mechanism of passivation of copper in NaOH solutions, based chiefly on the analysis of the curves of the ratio between the anodic current density and the anode potential during voltage controlled electrolysis. 9 ref. (R10c; Cu)

394-R. **Erosion of Aluminum.** E. H. Honeycutt, Jr. E. I. du Pont de Nemours & Co., *U. S. Atomic Energy Commission,* DP-214, May 1957, 16 p.

Specimens of aluminum were undamaged or eroded only slightly during two months of exposure to deionized water at velocities up to 125 ft. per sec. (R4; Al)

395-R. **Reaction of Steam With Uranium and With Various Uranium-Niobium-Zirconium Alloys at High Temperatures.** Alexis W. Lemmon, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-1192, June 17, 1957, 74 p.

Measurement of metal-water reaction rates, and emissivity determinations. 13 ref. (R4d; U)

396-R. (French.) **Research on the Oxidation Mechanism of Single Crystals of Iron at High Temperature and Under Low Oxygen Pressure.** Jean Bardolle. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 327, 62 p.

Preparations and experimental methods; aspects of oxidation of iron under different pressure and temperature conditions; phenomena of germination of iron oxide at 850° C. under very low oxygen pressure; orientation relationship between iron and ferrous oxide; general interpretations. 35 ref. (R1h; Fe, 14-11)

397-R. (French.) **Behavior of Nickel and Nickel Alloys in the Presence of Halogens.** L. Arbellot. *Revue du Nickel,* v. 23, Apr-May-June 1957, p. 45-51.

Effect of chlorine and hydrochloric acid on nickel, Monel and Inconel. (R6g; Ni)

398-R. (German.) **Demonstration of the Thixotropic Protective Layer on Metal.** Rikuro Otsuka. *Kolloid Zeitschrift,* v. 153, July 1957, p. 59. (CMA)

The formation of a thixotropic protective layer on pure titanium (99.3% by weight) was demonstrated by an experiment in which titanium sheet metal electrodes were immersed in 0.10 *N* aqueous potassium chloride. Simultaneous pitting and the formation of white, colloidal titanium oxide hydrate are observed on the application of 12 volts at the electrodes. 3 ref. (R2q; Ti)

399-R. (Italian.) **Anodic Corrosion of Iron in Reinforced Concrete.** Mario Maraghini and Cesare Ginnari. *Ricerca Scientifica,* v. 27, May 1957, p. 1500-1508.

Iron bars were coated with different types of cement mortar and seasoned 7 to 9 months. Spontaneous corrosion during seasoning was slight and did not interfere with results of tests for anodic corrosion. Variations in quantity of electricity passed through specimens caused marked differences in corrosion, possibly due to nature of cements and presence of chlorides. Variations of current density caused a minimum of variation in corrosion, suggesting a relationship between protective action of cement and its capacity to oppose local variations of pH. Measurement of difference of potential applied to system in function of time permitted determination of phenomena accompanying cracking of cement coatings.
(R6q; Fe, NM-f43)

400-R. (Book.) **Underground Corrosion.** Melvin Romanoff. National Bureau of Standards Circular 579, Apr. 1957. 227 p. $3.

Final report on studies conducted by the National Bureau of Standards from 1910 to 1955. In a field burial program more than 36,500 specimens, representing 333 varieties of ferrous, nonferrous and protective coating materials were exposed in 128 test locations throughout the United States. Electrical and electrochemical aspects of underground corrosion were studied in laboratory. Results of field and laboratory investigations are presented. 407 ref. (R8, 1-4)

Inspection and Control

408-S. Use of Elution Chromatography From Cellulose Columns for the Systematic Analysis of Special Steels. G. Venturello and A. M. Ghe. *Analyst,* v. 82, May 1957, p. 343-352.

Systematic determination and separation of molybdenum, cobalt, manganese, vanadium, nickel and chromium in steel which involves microchemical colorimetric determination of elements which are fractionally separated by elution from cellulose columns. 12 ref.
S11a; AY)

409-S. Absorptiometric Determination of Vanadium in Steel. P. H. Scholes. *Analyst,* v. 82, no. 976, July 1957, p. 525-528. (CMA)

Tungstophosphoric acid and 3:3′-dimethylnaphthidine were each studied as colorimetric reagents for determining vanadium in steel. At a concentration range of 0.-1.5 mg. vanadium per 50 ml., a tungstovanadophosphate compound is formed when sodium tungstate and phosphoric acid are added. Iron and chromium interference may be compensated for if tungsten is absent.
(S11a; AY, *V*)

410-S. Determination of Molybdenum in Titanium Alloys by Precipitation From Homogeneous Solution Using Thioacetamide. W. N. McNerney and W. F. Wagner. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1177-1178. (CMA)

Determining the molybdenum in titanium alloys by the thioacetamide precipitation of molybdenum disulphide obviates the use of hydrogen sulphide streams for this purpose. The dense precipitate is easily filtered. Atmospheric pressure is adequate if the thioacetamide is in five to tenfold excess. 5 ref.
(S11b; Ti, *Mo*)

411-S. Estimation of Titanium in Beach Sands. J. A. Corbett and D. H. Parkhurst. *Australasian Institute of Mining and Metallurgy, Proceedings,* no. 182, pt. 1, June 1957, p. 55-65. (CMA)

A colorimetric method. Other elements likely to be found in such deposits (e.g., iron, chromium, manganese, vanadium and columbium) do not interfere. Accuracy is within 0.3% for concentrates containing more than 95% TiO_2, and within 1% for tailings with 0.2% TiO_2. The method described uses a Hilger "Spekker" absorptiometer. 11 ref.
(S11a; Ti, 14-9)

412-S. Determination of Aluminium in Cast Iron and Ferro-Silicon by the Fluoride Volumetric Method. W. E. Clarke and R. C. Rooney. *British Cast Iron and Research Association, Journal of Research and Development,* v. 6, June 1957, p. 666-669.

Volumetric technique for determining aluminum content.
(S11j, CI, Fe, Si, AD-n, *Al*)

413-S. Time Savers in Brass Analysis. C. Goldberg. *Foundry,* v. 85, Aug. 1957, p. 102-104.

Chemical analysis, including determination of copper, nickel, iron, lead, phosphorus, tin, antimony, aluminum and sulphur. (S11; Cu-n)

414-S. Surface Examination by Radiation. A. E. Williams. *Industrial Finishing,* v. 9, July 1957, p. 685-690.

Possibilities of radioisotope thickness gages; use of electron diffraction camera for following surface roughness and metal structure; methods employing fluorescent or secondary X-radiation from base metal or fluorescent X-rays in plating metal itself for measurement of thin coatings; measurement of porosity in coatings with radioactive metals. (S15, S14e)

415-S. Radiography for Welding. Jay Bland. *Industry and Welding,* v. 30, Aug. 1957, p. 36-41, 63.

Radiation sources and factors determining selection; discussion of weld defects and interpretation of radiographic images. (S13e, 7-1)

416-S. Compositions of Unlisted Copper Alloys. *Machinery,* v. 63, Aug. 1957, p. 243-244.

Trade name, composition, applications and producer of wrought copper alloys not listed in Copper and Brass Research Association Manual of Standard Alloys. (To be continued.) (S22; Cu)

417-S. Determination of Micro Amounts of Calcium, Magnesium and Aluminium in Titanium Metal. Hidehiro Got and Shuro Takeyama. *Tohoku University. Research Institutes. Science Reports, Series A. Physics, Chemistry and Metallurgy,* v. 9, Apr. 1957, p. 138-146. (CMA)

Titanium removal by the extraction of titanous thiocyanate with ether. Procedures for the photometric determination of calcium, magnesium and aluminum after titanium extraction. 8 ref.
(S11a; Ti, *Ca, Mg, Al*)

418-S. Contributions to the Chemical Analysis of Copper in Zircaloy, Silicon in Uranium-Silicon Alloys, and Niobium in Uranium-Niobium Alloys. E. B. Read, P. R. Hicks, H. M. Lawler, E. Pollock, H. M. Read and L. Zopatti. Nuclear Metals, Inc., *U. S. Atomic Energy Commission,* NMI-1178, May 23, 1957, 17 p.

Procedure for the determination of copper in zircaloy by the application of neo-cuproine; the "peroxide" spectrophotometric method for the determination of columbium in uranium-columbium alloys.
(S11, Zr, *Cu,* U, *Si, Cb*)

419-S. Evolution of Economy in Testing Metals. Jack Fairlie. *Welding Engineer,* v. 42, Aug. 1957, p. 30-34.

Development of radiography in nondestructive testing of weldments and castings. Discussion of penetrant inspection, electrical resistance tests and ultrasonic process. (S13)

420-S. Behavior of Metal Heating Wires When Tested for Service Life. Pt. 2. Service Life as Function of Wire Gage. A. Schulze and D. Bender. *Metall,* v. 9, 1955, p. 878-882. (*Henry Brutcher Translation* no. 3742.)

Automatic temperature control arrangement combined with a counting mechanism for the number of switchings-in of the specimens being tested; study of both austenitic and ferritic alloy wires having diameters ranging from 0.008 to 0.12 in.; coils and V-shaped specimens of six different alloys. (S21; SGA-r)

421-S. Determination of Aluminum in Alloy Steels by the Cryolite Method. R. Leo and G. Konig. *Giessereitechnik,* v. 1, 1955, p. 26-28. (*Henry Brutcher Translation* no. 3788.)

Working procedures for the use of the cryolite method for determining aluminum in the presence of Cr, Ni, Mo, W, Ti, Cb and Zr; results obtained with up to 10% Al in the original steel or a composite solution from an alloy steel plus aluminum chloride. (S11; AY, *Al*)

422-S. Methods of Ultrasonic Testing of Welds. S. T. Nazarov and Yu. P. Panov. *Zavodskaya Laboratoriya,* v. 23, no. 3, 1957, p. 305-308. (*Henry Brutcher Translation* no. 3958.)

Methods of scanning welds for lack of fusion at edges and for internal defects, using inclined-face search units that introduce sound waves into the base metal well away from the actual weld site, with direct or reflected incidence of the sound on the weld. (S13g, K9r)

423-S. Measurement of Size of Internal Flaws in Metal by an Ultrasonic Technique. F. I. Ivanov and M. A. Akulin. *Zavodskaya Laboratoriya,* v. 23, no. 3, 1957, p. 309-311. (*Henry Brutcher Translation* no. 3968.)

Difficulties currently encountered in measuring the size of more or less deep-seated flaws with the ultrasonic flaw detector. Proposed technique of measuring a linear dimension of defects (even smaller in size than the search unit) with a relative error of 2 to 15%. (S13g)

424-S. Separation of Tantalum From Titanium. Yu. A. Chernikhov, R. S. Tramm and K. S. Pevzner. *Zavodskaya Laboratoriya,* v. 22, no. 6, 1956, p. 637-639. (*Henry Brutcher Translation* no. 3990.)

Previously abstracted from original. See item 458-S, 1956.
(S11, B14, Ta, Ti)

425-S. Determination of Small Quantities of Tin in Ores. I. A. Blyum and N. G. Zyryanova. *Zavodskaya Laboratoriya,* v. 22, no. 1, 1956, p. 46-47. (*Henry Brutcher Translation* no. 4003.)

Method for tin analysis in amounts of 0.005 to 0.10% in any ore, based on separation of tin from other elements by distillation as tetrabromide and susbsequent polarographic determination. (S11m; Sn, RM-n)

426-S. (French.) **Direct Determination of Metallic Zinc and Zinc Oxide in the Same Product.** Corneille Ek. *Revue Universelle des Mines,* v. 13, July 1957, p. 249-253.

Current methods of determining metallic zinc in zinc dust. In a solution of $HgCl_2$ + KCN with pH 6 only the metallic zinc in the mixture Zn-ZnO dissolves. (S11; Zn)

427-S. (German.) **Permanganometric Determination of Vanadium in Ferrovanadium After Reduction by Sodium Nitrite.** L. Erdey and K. Vigh. *Acta*

Chimica, v. 11, 1957, p. 73-83. (CMA)

The pentavalent vanadium is reduced by sodium nitrite to the tetravalent form and is titrated by potassium permanganate. The advantage of the method lies in the fact that trivalent iron is not reduced by the sodium nitrite, and so need not be removed before determination of the vanadium. The measurements can be carried out in about 1 hr. 20 ref. (S11j, V, Fe, AD-n)

428-S. (German.) **Separation and Determination of Vanadium, Molybdenum and Titanium by Capillary Chromatography.** P. Cerny. *Collection of Czechoslovak Chemical Communications,* v. 22, Apr. 1957, p. 614-616. (CMA)

Spot test using pyrocatechin is done in 3-10 min. and is very sensitive. Iron may be removed with rhodanide. (S11a; V, Mo, Ti)

429-S. (Italian.) **Spectrophotometric Determination of Boron in Aluminum Alloys With High Silicon Content Using 1,1'-Dianthrimide.** G. Matelli. *Alluminio,* v. 24, June 1957, p. 255-257.

Usefulness of method for the determination of boron in aluminum alloys containing 4-6% silicon. The quantity of boron which remains insoluble in acid is lower than the admissible analytical error. 5 ref. (S11k; Al, *B*)

430-S. (Japanese.) **Rapid Photometric Determination of Molybdenum in Ferromolybdenum by the Stannous Chloride Reduction Method.** Shuichiro Mitzoguchi. *Japan Analyst,* v. 6, June 1957, p. 376-381. (CMA)

Procedure. The relationship between light absorption and molybdenum content up to about 90 mg. is linear. 8 ref. (S11a, Mo, Fe, AD-n)

431-S. Determination of Vanadium and Chromium in Alloys With Uranium. H. H. Willard and O. H. Kriege. *U. S. Atomic Energy Commission,* LA-1957, Sept. 1955, 19 p. (CMA)

U-V and U-V-Cr alloys were analyzed for their constituents. The usual titrimetric ferrous sulphate method was studied for vanadium oxidized by ceric sulphate and by perchloric acid fusion. When chromium is present the latter is used, and then both vanadium and chromium are titrated with standard ferrous sulphate. (S11j; U, *V, Cr*)

432-S. Determination of Small Amounts of Carbon in Metallic Titanium and Alloys by the Conductometric Method. W. R. Sheehan. Watertown Arsenal Laboratory, Report 401/228, *U. S. Office of Technical Services,* PB 131119, Aug. 1954, 11 p. (CMA)

Titanium samples were analyzed for carbon content and homogeneity. The Leco CD10 conductometric carbon determinator was used. Results compared with those of other workers. (S11b; Ti, *C*)

433-S. Spectrographic Solution Methods for the Analysis of Slags. S. Bergenfelt. *Jernkontorets Annaler,* v. 140, no. 1, 1956, p. 75-80 and v. 141, no. 4, 1957, p. 231-232. (*Henry Brutcher Translation* no. 3879.)

Description and results for two procedures. (S11k; RM-q)

434-S. (Czech.) **Effect of the Nature of Electrolyte Selected for the Separation of Carbides of Steels.** N. Tietz, V. Toman and H. Tuma. *Hutnicke Listy,* v. 12, June 1957, p. 517-521. (CMA)

The following substances were tested for their suitability in electrolytic separation of carbides from steel samples, the stability of the product in the electrolyte serving as a criterion: hydrochloric acid, citric acid, sodium citrates, iron sulphate, complexone III and trilon B. After experimenting with carbides of iron, chromium, vanadium, molybdenum, tungsten, zirconium and tantalum, adequate electrolytes, temperatures and current intensities were determined for particular compositions of steels. 14 ref. (S11f; ST, 14-18)

435-S. (Czech.) **Analysis of Carbides Isolated From Steel.** M. Kroupa. *Hutnicke Listy,* v. 12, June 1957, p. 521-522. (CMA)

Chemical procedures for successive determinations of carbides in the anode mass remaining after the electrolytic treatment of steel samples. Metals identified in the carbide mass include tungsten, chromium, iron, vanadium, titanium and molybdenum.
(S11j; ST, *W, Cr, Fe, V, Ti, Mo,* 14-18)

436-S. (Czech.) **Spectrum-Analytical Determination of Low Contents of Titanium in Steels.** O. Belohlavek. *Hutnicke Listy,* v. 12, June 1957, p. 522-524. (CMA)

Titanium content in steels, ranging from 0.03 to 0.20%, can be determined from photographs of spark spectrum of steel samples serving as one of the electrodes, the other electrode being made of iron. The intensity of titanium lines 3349.035 Å and 3349.406 Å is compared with that of the line Fe 3399.34 Å. In the presence of considerable amounts of chromium in the steel it is recommended to use also the resultant of the line Fe 3347.927 Å covered by the line Cr 3347.837 Å. 8 ref. (S11k; ST, *Ti*)

437-S. (German.) **Supersonic Testing of Bonded Connections.** J. Bernert and S. Bönisch. *Fertigungstechnik,* v. 7, Feb. 1957, p. 81-82.

The reflecting method is used in testing bonded sheet metal 0.3 to 3.0 mm. thick. This method employs two crystals, one as transmitter and the other as receiver. Since the echo impulse method can only be used with material approximately 10 mm. thick, it is inapplicable here. (S13g; 7-8)

438-S. (German.) **Approximate Calculation for Determining Exposure Values for Gamma Radiography with Ir^{192} and Cs^{137}.** W. H. Papke. *Schweissen und Schneiden,* v. 9, July 1957, p. 349-353.

Influence of radioactivity, wall thickness and film emulsions on the exposure values; calculation of a correction factor; penetration of several walls and different materials; comparison of penetration performances. 4 ref. (S13e; Ir, Cs)

439-S. (Italian.) **Systematic Analysis of Titanium Alloys by Electron Chromatography in Cellulose Columns.** A. M. Gue and A. R. Fiorentini. *Annali di Chimica,* v. 47, July-Aug. 1957, p. 759-769. (CMA)

The determination of molybdenum, iron, manganese, aluminum and chromium in H_2SO_4-HNO_3 solutions of samples of titanium alloys is performed by successive elution in several columns of cellulose pulp, using acetylacetone as the principal element. Chromatographic fractions so obtained are examined colorimetrically. (S11a; Ti)

440-S. (Italian.) **Nondestructive Tests.** F. Baldi. *Fonderia Italiana,* v. 6, Mar. 1957, p. 121-125.

Types of tests and their applications; criteria for selection of control methods; comments on evaluation of results. 8 ref. (S13)

441-S. (Italian.) **Focus-to-Film Distance in Radiographic Inspection of Welds.** Giorgio Moravia. *Rivista Italiana della Saldatura,* Mar-Apr. 1957, p. 54-63.

On basis of permissible maxima of penumbra effect and of different penetrations of specimen by central and peripheral rays of the beam, minimum focus-film distances are calculated for some typical cases of weld inspection. Special attention to examination of circumferential welds of cylindrical bodies. (S13e; 7-1)

442-S. (Japanese.) **Radiographic Study of Casting Design.** Hirokuni Shiromura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 229-230.

Casting defects which can be identified by gamma rays are internal hot-tears, shrinkage, gas-holes, inclusions and sand spots. Design may be improved by study of defects. (S13e, 9-18, 9-19, 17-1)

443-S. (Japanese.) **Segregation in Casting. Report 7.** Kazuo Yasuda. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 223-234.

Segregation of aluminum-copper alloys studied by spectrographic analysis. The segregation curve shown from surface to center of the casting. (S11k; Al, Cu, 9-19)

444-S. (Japanese.) **Some Experiments on the Carbon Analysis of Cast Irons.** Tomoo Sato and Masami Kanno. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 447-451.

For obtaining the most reliable value in the carbon analysis of cast iron, all chips turned or drilled must be used for each analysis. The change of carbon content of spheroidal graphite cast iron after the addition of magnesium to the melt is discussed. 5 ref. (S11; CI, *C*)

445-S. (Japanese.) **Automation for the Iron and Steel Industry.** Masakazu Takahashi and Takeo Sakai. *Denki Zashi (OHM),* v. 32, no. 6, 1957, p. 34-51.

Automatic measurement for blast furnaces, Dwight Lloyd sintering machines, coke furnaces, converter soaking furnaces and reverberatory furnaces. 9 ref.
(S16, S18, D general; Fe, ST)

446-S. (Japanese.) **Studies on Rapid Analysis of Hydrogen in Titanium and Its Alloys.** N. Oda and K. Norishima. *Electrochemical Society of Japan, Journal,* v. 25, May 1957, p. 269-273. (CMA)

Experiments performed to obtain the best analytical conditions for determining hydrogen in titanium and its alloys. The extraction percentage of hydrogen by steel combustion analysis was compared with the hydrogen percentage as obtained by the vacuum fusion method. The combustion method was practicable for industrial analysis.
(S11r; Ti, *H*)

447-S. (Japanese.) **Method for the Continuous Measurement of Liquid Steel Temperature in the Ladle.** Riichi Katakura, Hiroshi Miwa and Yoshiro Wada. *Sumitomo Metals,* v. 9, Jan. 1957, p. 13-20.

An immersion thermocouple was employed and a fused alumina tube was used instead of a silica tube to protect the platinum thermocouple. The fused alumina tube was fixed on the ladle wall near the bottom, and covered with alumina cement and steel tube to prevent heat shock. Typical measurements on various size ladles are shown.

The temperature difference of liquid steel between the value observed by this continuous immersion method at the bottom of the ladle and one observed by this quick immersion technique at other places is about ± 20° C.
(S16, X9q; ST, 14-10)

448-S. (Japanese.) **Simultaneous Spectrographic Determination of Si, Mn, Cu, and Cr in Pig Iron.** Yoshifuru Niimi and Takashi Kitahara. *Sumitomo Metals,* v. 9, Jan. 1957, p. 31-42.

A condensed spark method was used with the Shimadzu medium quartz spectrograph (Cornu type). The electrodes for analysis are chill cast in the form of pencils, 8 mm. in diameter and 100 mm. in length. By checking various operating conditions such as the shape of electrodes, excitation, presparking, exposure, photography and selection of suitable line pairs, etc., some optimum conditions were found. In correlating daily chemical and daily spectrographic determination the coefficient of variation was found to be small. This procedure speeds up the analysis and increases the capacity as compared with chemical analysis. 9 ref.
(S11k; CI-a, *Si, Mn, Cu, Cr*)

449-S. (Russian.) **Investigation of Defective Rails.** V. G. Mikheev, *Stal',* v. 17, Apr. 1957, p. 343-347.

The largest portion of the defects was associated with local contamination of metal by nonmetallic inclusions and the presence of fine cracks and fissures in the middle of the rail base. A significant portion of the rails removed proved to be sound. (S13, T23q; ST, 9-19)

450-S. (Russian.) **Method of Temperature Measurement of Machined Surfaces.** L. G. Kulikov. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 46-48.

Method for measuring the temperature of the surface layer 0.03-0.04 mm. thick. The duration of the peak temperature at the cutting speed of 300 meters per min. is 0.003-0.004 sec. Approximately the same time is required to heat up the surface. Cooling is much slower and lasts 0.01-0.02 sec. 3 ref. (S16, G17)

451-S. (Russian.) **Temperature of Surface Layers of Parts on Polishing.** Sh. M. Dubinski. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 48-50.

Method for determining temperature of the polished surfaces. The temperature reaches 900-1100° C. at the polishing speed of 18 meters per sec. and 750-850° C. at the speed of 9 m./per sec. It is very likely that even higher temperatures may be reached. 4 ref. (S11, L10b)

452-S. (Russian.) **Determination of Molybdenum in Titanium-Molybdenum Alloys With the Aid of Ion-Exchange Chromatography.** I. P. Kharlamov and P. Ya. Yakovlev. *Zavodskaya Laboratoriya,* v. 23, no. 5, 1957, p. 535-536. (CMA)

It is proposed to use either sulphocarbon or aluminum oxide for chromatographic separation. The use of sulphocarbon is based on its ability to absorb MoO_2^{+2} in preference to TiO_2^{+2}, VO^{+2}, Cr^{+3}, Mn^{+2}, Fe^{+3}, Co^{+2} and Ni^{+2}. The use of aluminum oxide is based on the tendency of elements of the iron subgroup to form stable complexes with phosphoric, tartaric or citric acid which are readily absorbed on aluminum oxide, while molybdenum is not absorbed. 6 ref. (S11a; Ti, *Mo*)

453-S. Cast Steel Wheel Tested to Destruction. *Commonwealth Engineer,* v. 44, July 1, 1957. p. 80-81.

Test details; results of analysis and physical tests.
(S21, T23; ST, 5-10)

454-S. Measuring the Thickness of Sprayed Metal Coatings. R. E. Mansford. *Electroplating and Metal Finishing,* v. 10, July 1957, p. 208-212, 220.

Discusses problem of measuring thickness of sprayed metal coatings and compares pull-off gage, moving-iron and electromagnetic types of magnetic testers; adjustment and calibration of thickness measuring instruments. (S14, 1-2; 8-17)

455-S. Nucleonic Radiation Gage Control. *Journal of Metals,* v. 9, Aug. 1957, p. 1041.

Use of gamma radiation from radioactive isotopes for gage control in a British continuous hot strip mill. Advantages of gamma radiation over X-ray gages.
(S14e, W23, 1-2)

456-S. Digits Identify Aluminum Alloys. Donald M. White. *Magazine of Standards,* v. 28, Aug. 1957, p. 232-235.

Aluminum Assoc.'s standard system identifying wrought aluminum alloys, consisting of four digits; first digit indicates general group, second digit indicates modification of original alloy or impurity limits, last two digits identify the alloy or indicate aluminum purity. In general grouping, series 1 designates 99.00% minimum and greater, series 2 through 8 designate alloys grouped by major alloying elements, and series 9, new alloys. (S22; Al)

457-S. Control of Quality in Automation. Pt. 1. John Loxham. *Metalworking Production,* v. 101, July 26, 1957, p. 1275-1284.

Priniciples of control of stable processes; illustrates new methods automatically producing punch card records to show errors in dimensions and to provide a permanent record. (To be continued.)
(S14, 18-24)

458-S. Electrolytic Analysis of Copper Metal From Cyanide Solution. Walter O. Dow, Jr., and Gerald Bakker. *Plating,* v. 44, Sept. 1957, p. 969-970.

Accuracy and precision of the method described are within ½%. Total operating time is approximately 1 hr., 15 min. of which is spent on electrolyzing. (S11, L17; Cu)

459-S. Determination of Nickel, Magnesium, Zinc and Manganese in the Presence of Titanium by Titration With the Disodium Salt of Ethylenediamine Tetracetic Acid. B. M. Dobkina and E. P. Petrova. *Zavodskaya Laboratoriya,* v. 22, no. 5, 1956, p. 525-527. (*Henry Brutcher Translation* no. 3917.)

Procedures; error does not exceed 5%; the method is more accurate for manganese than Vollhard's or colorimetry.
(S11j; Ti, *Ni, Mg, Zn, Mn*)

460-S. Spectro-analysis of Magnesite and Openhearth Lining Materials From Solutions. N. V. Kandler, A. V. Mitroshina and I. L. Shmulenson. *Zabodskaya Laboratoriya,* v. 22, no. 4, 1957, p. 440-441. (*Henry Brutcher Translation* no. 4020.)

Description of a spectrochemical procedure for magnesia (20-95%) in magnesite and the material used for lining and repairing basic openhearth bottoms; apparatus and conditions of analysis.
(B19, S11, W18r; RM-h)

461-S. Inspection of Chromium Plates for Porosity. A. A. Polyakov and D. N. Garkunov. *Zavodskaya Laboratoriya,* v. 22, no. 4, 1956, p. 482-484. (*Henry Brutcher Translation* no. 4026.)

Importance of careful inspection of porous chromium deposits on machine parts, and difficulties encountered; description of an apparatus which fits inside a cylinder to enable the latter's inner surface to be examined at various points under a microscope.
(S13d; *Cr,* 8-12, 9-18)

462-S. (French.) **Application of Statistical Methods to the Study of Certain Problems Encountered in the Ore Treatment Industry. Pt. A. Divergence of Results in Chemical Analysis of Ores.** P. Blanquet. *Annales des Mines,* Feb. 1957, p. 96-99.

Analysis of reasons for divergence; account of tests using this and other methods for determination of Pb, Zn, Cu, Cr, Fe, S, Ag, SiO_2 and Cd.
(S11, S12; RM-n)

463-S. (French.) **Influence of Factors Involved in Foundry Production. Use of Statistical Methods.** Jean Gélain. *Fonderie,* no. 138, July 1957, p. 316-321.

Statistical methods as applied to manufacture of cast iron electric resistance grids revealed role of certain predominant factors and, consequently, which of these required special control.
(S12, E general, SGA-r, CI)

464-S. (French.) **Metallurgy and Microchemistry.** René Perrin. *Fonderie Belge,* no. 6, June 1957, p. 117-123.

Principal elements found in trace condition and their effect on quality and behavior of steels. Brief review of some present applications of microchemistry in field of pure science and in such specialties as metallurgy, petrography and biology.
(S11, 2-10; ST)

465-S. (German.) **Nondestructive Testing of Castings by Ultrasonic Waves.** Günter Bierwirth. *Giesserei,* v. 44, Aug. 15 1957, p. 477-485.

Necessity of a nondestructive test for the quality of castings; physical fundamentals of the test; measurements on single and two-phase brass; measurements on cast-iron brake drums. 3 ref. (S13g; CI, Cu, 5)

466-S. (German.) **Rapid Photometric Determination of Titanium in Copper Alloys.** Hugo Wiedmann. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 410-412. (CMA)

A rapid method for the determination of titanium in copper alloys, and under suitable conditions also in steel and aluminum alloys. The method is based on the reaction between titanium and chromotropic acid and the photometric measurement of the resulting red solution. 2 ref. (S11a; Cu, *Ti*)

467-S. (Japanese.) **Spark Test for Steel.** Yamato and Morikawa. *Japan Society of Mechanical Engineers, Journal,* v. 60, July 1957, p. 756-758.

Differentiation between killed steel and rimmed steel by spark test; characteristic spark tests.
(S10n; ST-c, ST-d)

468-S. (Italian.) **Classification and Testing of Cast Irons.** Alfredo Secciani. *Fonderia,* v. 6, July 1957, p. 295-306.

Detailed system of classification for steels, bronzes, alloys, etc., is proposed. "GPF 10/20" indicates a lamellar graphite iron with matrix of pearlite and 10 to 20% ferrite.

Types of tests that would provide useful information to design engineers, builders, founders; application of existing test methods and standards to cast irons and castings; analysis of possible objections to classification and testing systems proposed. (S22; CI)

469-S. (Italian.) **Polarographic Analysis of Iron Ores.** Maria Lucco Borlera. *Ricerca Scientifica,* v. 27, May 1957, p. 1492-1499.

Rapid method of polarographic determination of elements such as copper, manganese, lead, arsenic, sulphur and zinc to roasted ores or pyrites; ways of eliminating possible mutual interference of elements, particularly arsenic and sulphates, in determination of lead. (S11m; Fe, RM-n)

470-S. (Spanish.) **New Method of High Precision Quantitative Spectrochemical Analysis Without Use of Internal Master. Application to Fe.** Andres Rodriguez Perez. *Instituto del Hierro y del Acero,* v. 10, Apr-June, 1957, p. 166-170.

Behavior of spectral lines of iron studied by comparing two lines of same element. Investigation was made difficult by large number of lines characteristic of Fe. 6 ref. (S11k, Fe)

471-S. (Spanish.) **Spectrochemical Analysis of Anti-Friction Alloys.** A. Sampedro Pineiro and E. Asensi Alvarez-Arenas. *Revista de Ciencia Aplicada,* v. 11, May-June, 1957, p. 193-203.

Presentation of method for analyzing Sb-Sn, Cu-Sb-Sn and Sb-Sn-Pb alloys by means of optical emission spectra. Results compared with those obtained when reference specimens are used; influence of a third element on spectral emission; problem of segregation in preparation of reference specimens. 7 ref. (S11k; Sb, Sn, Cu, Pb)

472-S. (Spanish.) **Spectrochemical Determination of Silicon in Low and High-Alloy Steels.** Hilaria Carrancio de la Plaza. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 195-199.

Comparative study of Gerlach method of quantitative determination of silicon in steels and of method of comparison of intensities of two spectral lines. Presence of a third element exerts no influence on determination of silicon in high-alloy steels when Gerlach method is used; this method is the more accurate of the two studied; line comparison method gives excellent results in zone of 0.1% to 2.85% concentration. 7 ref. (S11k; AY, *Si*)

473-S. (Spanish.) **Institute Activities: Standard Samples.** *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 211.

Iron and Steel Institute will soon have available homogeneous samples of six types of carbon and alloy steels of Spanish manufacture. Each type will be packed 100 g. of chip per container, accompanied by certificate of chemical analysis, recommended methods of analysis and technological data on the given steel. Other standard samples are in preparation. (S12h, S11; CN, AY)

T Metal Products and Parts

252-T. **An Introduction to Driving Springs (Tension Springs).** W. Tüting. *Draht (English Edition),* no. 28, Apr. 1957, p. 24-30.

Composition and mechanical properties of spring steel strips; manufacturing, annealing and hardening methods; design and torsion characteristics of spring. (T7c; ST)

253-T. **Why Not Try Titanium?** H. B. Bomberger, G. T. Bedford and R. M. Lorz. *Food Engineering,* v. 29, Aug. 1957, p. 97-98, 100. (CMA)

Titanium is urged as a material for equipment in the food processing industry because of its corrosion resistance to organic acids and a variety of foods (onion, tea, etc.). Corrosion resistance of a hypochlorite filter press made of titanium is cited as an example. Applications in the presence of dilute nitric acid are noted. (T29p, 17-7; Ti)

254-T. **Aluminum Cladding of Buildings.** E. H. Laithwaite and E. W. Skerrey. *Journal of Applied Chemistry,* v. 7, May 1957, p. 216-231.

Installation and service precautions, corrosion resistance, laboratory and field tests, service experience. 29 ref. (T26n; Al, 8-16)

255-T. **Some Aspects of the Production and Applications of Cold Forged Light-Alloy Large-Diameter Rivets.** C. G. Williams. *Light Metals,* v. 20, June 1957, p. 196-198.

Rivet manufacture, closing techniques and corrosion. (T7f, 17-7; Al)

256-T. **Stainless Steel. A Review of Its Advantages and Uses.** P. M. Slater. *Sheet Metal Industries,* v. 34, July 1957, p. 503-516, 528.

Use of stainless steel sheet and strip in automobile industry, hospital and food handling equipment, in architectural design, tableware cutlery and consumer products. (T general, 17-7; SS)

257-T. **A Look Ahead at Part Making.** *Steel,* v. 141, July 29, 1957, p. 112-115.

New applications of die casting, impact extrusion, cold extrusion, cold welding, carbon dioxide welding, cold spline rolling, compacting and sintering methods for production of accessories and components of automobiles. (T21c)

258-T. **Look to Aluminum Die Castings When Parts Must Be Light and Strong, Pressure Tight, Intricate, Complex, Big, and Colored.** *Steel,* v. 141, Aug. 5, 1957, p. 89-92.

Aluminum die castings find increasing use as automobile accessories, components and in other fields. (T21c, 17-7; Al, 5-11)

259-T. **Development of Cast Fuel Elements.** H. A. Saller, R. F. Dickerson, A. W. Hare and N. E. Daniel. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-983, Feb. 21, 1955, 26 p.

The feasibility of casting a bare, radiator-type fuel element of the uranium-chromium eutectic alloy (5% chromium) was investigated. Castings of both perforated-hexagonal subsections and grooved-plate longitudinal sections of the perforated-hexagon subsection of the fuel element were attempted. (T11g, 17-7, E general; U, *Cr*)

260-T. (French and English.) **Aluminum Foil in the Packaging of Soft Cheese.** E. Sutter. *Aluminium Suisse,* v. 7, May 1957, p. 114-115.

Aluminum foil has now displaced tinfoil as a packaging material. Currently 90% of all soft cheese exported from Switzerland is wrapped in aluminum foil. (T10g, 17-7; Al, 4-6)

261-T. (French and English.) **Use of Aluminum Foil in Textile Industry.** A. Morf. *Aluminium Suisse,* v. 7, May 1957, p. 122.

"Cellometal" is a composite material and is manufactured by using aluminum foil 100 by 0.012 mm. thick, rolled to a high polish and sandwiched between two transparent acetate foils. Material is slit to ribbons and is woven into fabrics and spun into threads. (T29q, 17-7; Al, 4-6)

262-T. (French and German.) **Foil in the Packaging Industry.** E. Locher. *Aluminium Suisse,* v. 7, May 1957, p. 92-97.

Excellent protection provided for the shielding of organic products from the effects of heat, air, sunlight and moisture. Types of packaging; methods; automatic-packaging machines; treatment of the foil; applications and examples. (T10g, 17-7; Al, 4-6)

263-T. (French and German.) **Aluminum Foil in the Electric Cable Industry.** G. Weissenberger. *Aluminium Suisse,* v. 7, May 1957, p. 97-100.

Electrostatic shielding of high voltage conductors by means of paper-backed aluminum foil. This method provides freedom from ionization effects inside the sheathing and superior thermal stability. Other applications include the shielding of telephone cables. (T1b, 17-7; Al, 4-6)

264-T. (French and German.) **Aluminum Foil in Electric Capacitators.** G. Muriset. *Aluminium Suisse,* v. 7, May 1957, p. 100-105.

Excellent electric conductivity and tensile strength of aluminum foil. Foil must be flawless, dimensionally accurate, of high quality, uniformly etched and clean. By using foil, capacitators are produced with 4 smaller size and at a low cost. 4 ref. (T1e, 17-7; Al, 4-6)

265-T. (French and German.) **Aluminum Foil Used to Package Butter.** D. Stüssi. *Aluminium Suisse,* v. 7, May 1957, p. 109-114.

Foil for this purpose is 0.008 mm. thick and of 99.0 to 99.5% purity. Light paper serves as a backing and odorless paraffin with wax as a bonding agent. Several types of automatic wrapping equipment currently in use in Switzerland are described. (T10g, 17-7; Al, 4-6)

266-T. (French and German.) **Aluminum Foil for Decoration and Child Play Activity.** H. G. Waser. *Aluminium Suisse,* v. 7, May 1957, p. 120-121.

Foil as used in gift wrapping, Christmas packaging and as material for the fashioning of flowers and novelties. (T10, 17-7; Al, 4-6)

267-T. **High-Temperature Strength Zirconium and Titanium-Base Alloys for Fuel Element Jacketing. Final Report.** K. F. Smith and H. H. Chiswik. *U. S. Atomic Energy Commission,* ANL-5339, Feb. 1956, 15 p. (CMA)

The metals themselves are suitable as regards corrosion resistance and thermal conductivity, but additions of aluminum or tin confer greater hot strength and weldability. Zirconium-titanium was used as a binary base for ternary additions, but the resulting alloys were weak. (T11g, 17-7; Zr, Ti)

268-T. **Catalytic Effect of Titanium on the Oxidation Stability of Lubricants.** H. F. Campbell and M. M. Jacobson. Watertown Arsenal Laboratory, Report 401/233. *U. S. Office*

of Technical Services, PB 131106, July 1955, 28 p. (CMA)

The catalytic effect of several titanium alloys on the oxidation stability of selected lubricants was studied under accelerated conditions. The Norma-Hoffmann oxygen bomb method was used.
(T29, 17-7; Ti, NM-h)

269-T. (French.) **Copper Aluminum Alloys for Use in the Chemical and Allied Industries.** Pierre Weill Couly. *Genie Chimique.* Supplement of *Chemie et Industrie,* v. 77, Apr. 1957, p. 106-113.

Metallurgy of these alloys; their resistance to corrosion, atmospheric attack, sea water, acids, bases, salts; effect of welding on corrosion resistance; resistance to pitting; effect of temperature on mechanical characteristics; weldability. It is suggested that cupro-aluminums could replace copper, stainless steel and some nickel alloys in selected applications.
(T29, A general, 17-7; Al, *Cu*)

270-T. (Italian.) **Nickel Catalysts for Hydrogenization of Oils and Greases.** *Nickel,* no. 68, June 1957, p. 7-13.

Dry, wet and Raney processes for obtaining nickel catalysts; processes and equipment used in hydrogenization, action of the catalyst, its poison effects, characteristics of hydrogenated fats. (T29, 17-7; Ni)

271-T. Uses of Lithium Metal. Walter M. Fenton, Donald L. Esmay, Ronald L. Larsen and Herbert H. Schroeder. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 16-25.

Lithium metal may be used as an alkylating agent in Grignard-type reactions in the production of synthetic vitamin A and other pharmaceutical products, as an ionic catalyst in new polymer technology, as a direct reducing agent in certain organic reactions, as a flux in new brazing techniques, as a starting point in production of metallic hydrides and boro-hydrides. 52 ref.
(T29, 17-7; Li)

272-T. Materials for Helical Compression Springs for Use at Constant Deflection From 600 to 1400 F. R. G. Matters and R. E. Lochen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 677-686.

The relaxation characteristics of compression springs under constant deflection loading; results presented on the basis of an effective residual stress calculated from the recovery of the spring when the restrain was released. 3 ref. (T7c, 17-7)

273-T. Alloy Titanium in P and WA J57 Jet Engines. R. Hawthorne. *Aviation Age,* v. 28, Aug. 1957, p. 34-35.

Many aircraft of the Air Force and Navy use the J57 jet engine, which has titanium alloy compressor disks, disk spacers, compressor cases, blading and inlet. The 400 lb. saved in the engine mean savings of 1600-4000 lb. in the airframe.
(T24b, 17-7; Ti)

274-T. Aluminum in the Electrical Industry. *Electrical Journal,* v. 158, May 24, 1957, p. 1534-1538.

Application of aluminum and its alloys in conductors and conductor accessories, as a structural material, in busbars, in cable sheaths.
(T1, 17-7; Al)

275-T. Aluminum Auto Design. *Light Metal Age,* v. 15, Aug. 1957, p. 16-17.

Examples of future applications in automobile styling utilizing aluminum as devised by Kaiser Aluminum. (T21, 17-7; Al)

276-T. Application Characteristics of Titanium Bolts. Joseph Viglione. *Machine Design,* v. 29, Aug. 1957, p. 86-89. (CMA)

The operating characteristics were studied for titanium alloy bolts under load. A number of different coatings and nut materials were used to find the combination which minimized seizing and galling the most. Torque-tension relationships and bolt relaxation were tested.
(T7f, 17-7, Q10; Ti)

277-T. Aluminum Boat Building. *Mechanical World and Engineering Record,* v. 137, Aug. 1957, p. 344-348.

Welding and riveting techniques. Advantages or argon arc welding, use and advantages of aluminum rivets as compared with steel rivets.
(T22g, 17-7, K1d, K13n; Al)

278-T. Alloy and Special Steel in Railway Work. Hugh O'Neill. *Metallurgia,* v. 56, Aug. 1957, p. 74-76.

Applications of alloy steels to railroad track, locomotives and other rolling stock. Advantages of alloy and special steels compared with plain carbon material. 14 ref.
(T23, 17-7; AY)

279-T. Manufacture and Use of Stainless Steel Bellows Expansion Joints. *Pipes and Pipelines,* v. 2, Aug. 1957, p. 24-25, 40.

Some small diameters are made from seamless drawn tube, but most bellows are made from tube, which is preformed from cold rolled sheet of controlled gage, with a longitudinal butt weld. (T26r, 17-7; SS)

280-T. A New Stainless for Atomic Energy. J. Alfred Berger and W. L. Keene. *Steel,* v. 141, Sept. 9, 1957, p. 104-107.

Use of Type 304 stainless with 1 and 2% boron additions in thermal shields and control rods of atomic reactors. Mechanical properties of boron steels; hot working, casting, forging, hot rolling and forming processes.
(T11j, T11m; A general; SS, *B*)

281-T. Lithium and Other Alkali Metal Polymerization Catalysts. Frederick C. Foster and John L. Binder. Paper from "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 26-33.

Lithium differs from the other alkali metals in that it directs the polymerization of butadiene or isoprene predominantly to 1, 4 addition structures. The differences in physical properties, accompanying the structural variations mentioned above, are illustrated by the example of lithium-catalyzed polybutadiene. 14 ref. (T29s, 17-7; Li)

282-T. Imagineering With Carbides. Harold York. *Tooling and Production,* v. 23, Aug. 1957, p. 77-80.

Bi-carbide tool construction permits effective use of new super-hard carbides with a gain in tool life of 200 to 300%. (T6n, 17-7; 6-19)

283-T. Effectiveness of Control-Rod Materials. Russell W. Dayton. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1196, June 24, 1957, 40 p.

Effectiveness of a number of elemental materials established; the methods of calculation are expected to prove useful in the development of improved control materials by predicting combinations of materials which will possess high control effectiveness. 12 ref. (T11j, 17-7)

284-T. Wrought and Welded Ornamental Ironwork. A. W. Patz. *Welder,* v. 26, Jan-Mar. 1957, p. 11-16.

Welded iron and steel used in gates, pillars, grilles and rails.
(T9q, 17-7, K general, ST, CI)

285-T. "Hot Airplane" Requires Design Ingenuity for Proper Use of High Strength Steel Alloys. Alf F. Ensrud. *Western Metals,* v. 15, Aug. 1957, p. 51-54.

Problems and means of overcoming higher density disadvantage of heat resistant materials.
(T24, 17-7; ST, SGB-s)

286-T. (Brochure.) **Aluminum in Electrical Engineering.** No. AB10-5571, 72 p. May, 1957. Aluminium Development Association, 33 Grosvenor St., London, W.I.

Standards, properties, existing applications and potentialities, and joining. (T1, 17-7, S22; Al)

287-T. (French.) **Cigaret Lighters.** *Cuivre Laitons Alliages,* v. 32, July-Aug. 1957, p. 19-23.

Processes in the manufacture of miniature copper butane tanks for cigaret lighters, including degreasing, stamping and machining.
(T9, 17-7; Cu)

288-T. (French.) **French Firm Develops New Ceramic Cutting Tools.** Leon Gion and Louis Perrin. *Machine Moderne,* v. 51, Aug. 1957, p. 9-20.

Description of "Ceroc" tools developed by Compagnie d'Electro-Ceramique. Square, round or triangular tool bits made of fritted ceramic material are mechanically mounted on holder; bits have two precision ground faces, each providing, by means of indexing in holder, several cutting edges. When edges are worn down, bit is discarded for a new one; exceptional wear resistance makes possible hitherto unknown cutting speeds. Manufacturing process, performance, wear qualities, use. (T6n; SGA-j, 6-20)

289-T. (French.) **Steels for Pipe Systems Operating Over 600° C.** J. Ivernel. *Revue du Nickel,* v. 23, Apr-May-June 1957, p. 31-39.

Typical service conditions; properties demanded of steels in pipes submitted to high temperatures; types of steel used; improvement of ferritic steels; modification of microstructure and chemical composition; tubes in austenitic steels. 6 ref. (To be continued.)
(T general, 17-7; AY, SS, SGA-h, 4-10)

290-T. (French.) **Research on Ni-Cr and Ni-Cr-Co Alloys Used in Turbine Blades.** (Continued.) J. Poulignier. *Revue du Nickel,* v. 23, Apr-May-June 1957, p. 40-44.

Temperature attained by the various parts of the blades; cold working; skin annealing; microstructure. 10 ref. (T7h, 17-7; SS, SGA-h)

291-T. (French.) **Lightweight Materials and Transport Vehicles. Boron.** *Revue Universelle des Mines,* v. 13, Aug. 1957, p. 364-365.

Use of aluminum, magnesium and plastics to reduce weight and price, increase efficiency of passenger vehicles; aluminum alloys for chassis, tanks, delivery trucks.
(T21, 17-7; Al, Mg)

292-T. (German and French.) **Aluminum in Chemical Equipment.** (Con-

tinued.) E. Moor. *Aluminium Suisse,* v. 7, July 1957, p. 150-164.

Aluminum and aluminum alloys used in the chemical industry; comparison of the properties of aluminum with those of other metals; resistance to corrosion; problems of construction and design; surface treatment; examples of typical uses. (T29, 17-7; Al)

W Plant Equipment

343-W. Precision Barrel Finishing. Pt. 2. William E. Brandt. *Automatic Machining,* v. 18, July 1957, p. 49-53.

Barreling equipment; drum shape and size, speed and horsepower, provisions for safety and maintenance. (W2s, 1-2)

344-W. New Flux Electrode Welds Steel. *Canadian Machinery,* v. 68, June 1957, p. 201-202.

Dual-Shield method is a combination of flux-cored electrode and carbon dioxide shielding gas. Granulated flux additive contains an ionizer, deoxidizer and slag-forming agent. (W29h, 1-2; ST)

345-W. Selection and Application of Material Handling Equipment. John J. Watson. *Foundry,* v. 85, Aug. 1957, p. 86-99.

Shakeouts, hoppers, feeders, conveyers, storage, sand mixers, automation and system layout. (W19h, W12, E general, 18-17)

346-W. Gas-Fired Forging Furnaces Aid Reduction of Metal Losses. Arthur Q. Smith. *Industrial Heating,* v. 24, July 1957, p. 1336-1342.

Scale formed in gas-fired furnace is easily removed. Scale loss can therefore be accurately determined and billet weight held to a minimum. (W20h, F22; 9-2)

347-W. How to Get the Most Out of Your Iron Powder Electrodes. *Industry and Welding,* v. 30, Aug. 1957, p. 27-31.

Comparison of iron powder and conventional electrodes in principle and practice. (W29h, 1-2)

348-W. Some Facilities for the Study of Plutonium and Its Alloys. G. K. Williamson, D. M. Poole and J. A. C. Marples. *Institute of Metals, Journal,* v. 85, June 1957, p. 431-436.

Glove-boxes and apparatus for the safe handling, heat treatment, X-ray and metallographic examination of plutonium and its alloys. 11 ref. (W12a, X4, 1-2, Pu)

349-W. (Italian.) **Hot Milling Machine for Ingots.** *Tecnica Italiana,* v. 22, Mar. 1957, p. 119-123.

Processing of ingots with hot miller compared with other procedures. Hot milling simplifies preparation cycle, reduces time required to treat ingots before hot rolling, results in minimum heat loss and fewer rejects at rolling stage. Description of Innocenti miller capable of handling ingots weighing up to three metric tons; loading and delivery devices; tooling. (W20j, 1-2; 5-9)

350-W. Co-Operative Trials on All-Basic Furnace Roofs. B. Ceram. *Iron and Steel,* v. 30, June 8, 1957, p. 312-324.

Bricks used in the trials were chromium-magnesite and magnesite-chromium. Results show that design and operation of furnace have a greater influence on life obtained than differences in brick quality. Results do not justify placing the bricks in a definite order of merit, but some conclusions on brick quality could be drawn. (W18r, 1-2; RM-h)

351-W. Extrusion Press Tooling. Pt. 2. Frank Sowa. *Light Metal Age,* v. 15, June 1957, p. 27-30.

Composition of steel and heat treating of liners for container on presses designed for aluminum extrusion; assembly of liner and container; problems in reconditioning containers. (W24g, F24, 1-2; ST)

352-W. Racks for Anodizing. J. E. Bunch. *Metal Finishing,* v. 55, July 1957, p. 45-49.

Factors in the design, selection of coating, and choice of metals for racks used in anodizing; compares aluminum, copper, phosphorus bronze and titanium as rack materials. (W3g, 17-7; Al, Cu, Ti)

353-W. Furnaces for Sintering and Heat Treating Powder Metal Parts. N. K. Koebel. *Metal Progress,* v. 72, Aug. 1957, p. 65-68.

Furnaces for sintering powder metal parts may be of mesh-belt, roller-hearth or mechanical pusher type, depending on requirements. The batch-type vertical radiant tube furnace is particularly suited for hardening sintered iron and steel parts in controlled atmospheres. (W26e, W27, 1-2; 6-22)

354-W. Gas Converters. A Survey of the Operation and Control of Exothermic and Endothermic Converters. Walter Holcroft. *Steel Processing and Conversion,* v. 43, July 1957, p. 398-403.

Factors influencing composition of gas produced by endothermic and exothermic gas generators and method of composition control for protective atmospheres. (W28q, 1-2)

355-W. Testing Electrodes for Usability and Efficiency. Bela M. Ronay. *Welding Engineer,* v. 42, July 1957, p. 34-36.

Diagram of apparatus which permits quick test of electrode deposition qualities and indicates best arc length and current values. Brief description of mild-steel electrodes. (W29h, 1-2; ST)

356-W. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 42, July 1957, p. 46-51.

Chemical analyses of E series stainless steel filler metals. Mechanical properties of corrosion resisting steel weld deposits. (W29h, 17-7, Q general; SS)

357-W. (German.) **Salt Impregnation for the Linings of Aluminium Melting and Holding Furnaces.** W. Helling and E. Kistermann. *Aluminium,* v. 33, Aug. 1957, p. 514-520.

In casting aluminum ingots and producing aluminum castings it is important to melt, hold and cast metal with the least possible melting losses and energy consumption and the highest possible output without contamination. In this process silica from chamotte linings of furnaces reacts with liquid aluminum and alloys it with silicon. To eliminate the trouble the pores of the furnace masonry were sealed so as to reduce its surface area and thereby the rate of its interaction with the melt. Sealing by melting a mixture of 80% sodium chloride and 20% cryolite in a furnace was tried out with good results. (W19a, 1-2; Al, RM-h)

358-W. (German.) **New Kind of Pig Mold.** F. Schmidt. *Aluminium,* v. 77, July 25, 1957, p. 523-524.

Possesses close, two-way toothing which makes it easy to build up very stable stacks, with particularly efficient space utilization. The molds are built on a support which is cast separately of the same alloy. This support is fashioned so that it can be lifted from all four sides by a fork lift truck. (W19c, 17-7; Al)

359-W. (Russian.) **Inertia-Type Shaking Screen.** K. A. Chaikovski. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 15-17.

Mechanical screens shake the sand out of the molds more efficiently than those operated by compressed air. The screens are mounted on spiral springs and set into vibration by rotating eccentric weights. The sand falls into a hopper below. (W19h, 1-2)

360-W. (French.) **Plaster Molds for Bronze With Beryllium.** Louis Grand. *Fonderie,* no. 137, June 1957, p. 265-269.

Comparison with sand casting; casting techniques; applications. 4 ref. (W19g, 1-2; Cu-s, *Be*)

361-W. (German.) **Rectifying Equipment in Modern Rolling Mills.** Hans-Joachim Mau. *Neue Hütte,* v. 2, May 1957, p. 299-307.

Comparison between rectifying drives and drives with rotary transformers and amplifiers; rectifier construction types; application of rectifying drives in continuous mills; reversing mills equipped with rectifying drives; Ward-Leonard transformers provided with rectifying excitation controls; coiling drives for reversing strip mills; winding drive with a variable speed governor. 14 ref. (W23n, 1-2)

362-W. (German.) **Transverse Flow Determination as an Expedient for the Designing of Rolls for Sectional Steel.** Horst Neumann and Wolfgang Lehmann. *Neue Hütte,* v. 2, May 1957, p. 307-317.

Transverse flow calculation in the case of restricted spreading; transverse flow investigations of sections; utilization of transverse flow calculation for redesigning and new designing of rolls, illustrated by the example of a "goblet iron" roll design; derivation of general rules. 9 ref. (W23k, 1-2, 17-1; ST)

363-W. (German.) **Damage by Undermining of Foundations in Strip Mills.** Alfred Degen. *Stahl und Eisen,* v. 77, July 25, 1957, p. 1018-1027.

Aligning foundations; foundations required in the hot rolling mill for the pusher-type furnace, scalebreaker, roughing stands, roller tables, finishing stands, coilers and sheet pilers. Recommended types of foundations in the cold rolling mill for the pickling plant, four-stand tandem mill train, temper rolling mill stand, shear train and annealing plant. (W10b, W23, 1-2)

364-W. (Italian.) **Ovens With Recirculation Heating Systems.** G. Farnesi. *Fonderia Italiana,* v. 6, Mar. 1957, p. 111-116.

Recent developments in closed circuit heating systems for form driers and core ovens; requirements such ovens should fulfill; advantages of "recirculation" ovens; types; temperature control and safety features. (W19k, 1-2)

365-W. (Italian.) **Electrode Coatings and Their Function.** R. Bostik. *Rivista Italiana della Saldatura,* v. 9, Mar-Apr. 1957, p. 49-53.

Functions of coatings; ionization of arc atmosphere; acid coverings; efficiency of alloy elements in electrodes; basic coatings and properties of metal deposited by basic electrodes; influence of composition of coating and deposited metal on hot cracking, with report of some experimental results. 12 ref. (W29h, 1-2, 17-7)

366-W. (Japanese.) **Study of Glass Mold Materials.** Tomosaburo Mitsui. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 218-220.

Function, composition and properties. 3 ref. (W19g, 1-2; NM-f42)

367-W. (Japanese.) **Cupola Tuyeres. Report 3. Projecting Water-Cooled Tuyere.** Toshio Suzuki. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 252-254.

Temperature, pressure and distribution of carbon dioxide in cupola furnace in relation to type of tuyére, angle of tuyére, volume of air and size of coke. (W18d, 1-2)

368-W. (Japanese.) **Combustibility of Carbonaceous Mold Coating Materials.** Yutaka Kawano. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 325-329.

Combustibility of coatings of graphite and carbonaceous materials at different temperatures. (W19g; NM-k36)

369-W. (Japanese.) **Manufacture of Cast Steel Crankshafts.** Shizuya Maekawa and Takeshi Yamashita. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 415-426.

Recently, castings have been taking the place of forgings for diesel crankshafts; method of manufacture, chemical composition and mechanical properties of the castings. 4 ref. (W11j, 17-7; ST, 5-10)

370-W. (Japanese.) **Design and Construction of Tap Holes, Slag Spouts and Crucibles for Cupola Furnaces.** Ishino and Kisao Abe. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 461-465.

Several types of tapholes and their advantages and disadvantages. (W18d, 1-2, 17-7)

371-W. (Russian.) **Study of the Gripping Capacity of Plate Mill Rolls.** M. M. Gorenstein. *Stal',* v. 17, Mar. 1957, p. 239-242.

Substantial improvement in the gripping capacity, and consequently also in efficiency, of three-roll plate mills was attained by the use of one steel and two cast iron rolls. The last pass was made between the cast iron rolls to produce a better surface. Influence of the material of the rolls and that of the composition and temperature of the rolled metal is discussed. (W23b, 1-2)

372-W. (Russian.) **Isobutylene Protective Lining for Pickling Bath Underlayer.** V. L. Vinarsky. *Stal',* v. 17, Mar. 1957, p. 272-273.

For protection against corrosion in pickling baths it has been found expedient to use an underlayer lining made of isobutylene, which is inexpensive and does not require vulcanization. (W3a, 1-2, L12g)

373-W. (Russian.) **A Study of the Causes of the Formation of Deposits in Wet Gas-Cleaning Installations.** F. I. Belan. *Stal',* v. 17, Apr. 1957, p. 366-369.

The deposits which are precipitated in the gas-cleaning installations when smelting ferromanganese consist mainly of calcium carbonate. To prevent these deposits it was found expedient to use an additional hollow scrubber installed before the gas-cleaning system, which collected the greater part of the dust particles which the gas contained. (W13c, 1-2)

374-W. (Russian.) **Typical Blast Furnace (2286 Cu. M. Volume): Problems of Mechanization and Automation.** A. E. Sukhorukov. *Metallurg,* v. 2, May 1957, p. 5-8.

General discussion of mechanization and automation of raw material charging, humidification, heating, controls, running, disposal of cast iron, slag and process waste. (W17g, 1-2, 18-24)

375-W. (Russian.) **Increase of Roll Durability on Rolling of Parts With Periodically Varying Profile.** I. I. Bornatzki, E. E. Belousova and N. M. Pavlenko. *Metallurg,* v. 2, May 1957, p. 24-25.

Steel composition and heat treatment. Improved rolls last 3 to 4 times longer. (W23k, 17-7; ST)

376-W. (Russian.) **Thin-Walled Molds for Killed Steel.** A. M. Danilov. *Metallurg,* v. 2, June 1957, p. 19-20.

Experiments with molds of uniform wall thickness show that there is no difference in quality, composition and crystalline structure of the ingots cast in such molds in comparison with the ingots cast in regular molds. New molds have better durability by 23.8%. The design of the new mold is described. (W19c, 1-2; ST)

377-W. (Russian.) **Machine for Speeding up of Openhearth Charging.** A. V. Kolesnikov. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 19-22.

Drawbacks of regular charging equipment; brief descriptions of more advanced machines; detailed description of two machines requiring no furnace alterations. (W12b, D2, 1-2)

378-W. (Russian.) **Blast Furnace Plant Slag Ladle Equipped With New Rigid Fins.** K. A. Pak. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 23-25.

Operation of slag ladles. Service life of ladle is 2 to 3 months only; an improved design with reinforcing fins is proposed and drawings presented. (W19b, D1, 1-2; RM-q)

379-W. (Russian.) **Induction Heater With a Reciprocating Feeder.** Yu. I. Kitajgorodzki, M. G. Kogan and V. A. Tyzlikova. *Vestnik Mashinostroenia,* no. 3, Mar. 1957, p. 57-58.

Induction heaters for heat treatment of billets when fed by pneumatic pushing devices are not suitable for handling of heavy parts and intermittent operation. An induction heater fitted with a reciprocating feeder enables handling of the heavy billets in a batch process. The energy consumption of the heater is 0.6 kw.-hr. per kg. 4 ref. (W28s, 1-2)

380-W. **Sodium Handling at Argonne National Laboratory.** F. A. Smith. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 42-59.

Sodium, used as a heat transfer fluid, can most effectively remove heat from a fast breeder reactor; presents the engineering mock-up of the experimental breeder reactor II and illustrates associated pumps, valves, and instrumentation. (W11p, 17-7, X13; Na, 14-10)

381-W. **Dosco Opens Canada's Biggest Tilting Furnace.** *Canadian Machinery,* v. 68, Aug. 1957, p. 116-118.

A 225-ton, liquid fuel-fired openhearth furnace built on two large rocker girders. It may be tilted forward 25° for tapping and 15° for slagging. (W18r, 1-2)

382-W. **High-Temperature Properties of Mould Refractories.** *Castings,* v. 3, June 1957, p. 15-17.

Effect of heat on properties of clay bonded sands; data on effect of heating on bulk density of bentonite and kaolinitic clay. (W19g, NM-f45, RM-h35)

383-W. **Vacuum Lift Speeds Handling of Sheets on Turret Punch Press.** E. J. Egan, Jr. *Iron Age,* v. 180, p. 94-95.

Vacuum hoist used for loading and unloading sheets as large as 4 x 7 ft. into punch press. (W12q, W24g, 1-2, 1-23; 4-3)

384-W. **Scrap Refinery Controls Smoke With Water Scrubber.** L. Bykowski. *Iron Age,* v. 180, Aug. 15, 1957, p. 96-97.

Scrubber cleans dust and fumes produced by burning scrap. (W13c, 1-2; RM-p)

385-W. **Traveling Hood Exhausts Ingot Fumes.** *Iron Age,* v. 180, Aug. 22, 1957, p. 102-103.

Fumes from leaded steel ingot exhausted by traveling hood car which moves with ladle. (W13c, W18n, 1-2; ST, *Pb*)

386-W. **Selection and Economy of Equipment for Blooming and Slabbing Mills.** Kurt Schlesinger. *Iron and Steel Engineer,* v. 34, July 1957, p. 63-74.

Equipment, plan arrangement and economics of three-high blooming mill, two-high reversing blooming and slabbing mill for medium production and two-high reversing blooming mill for high production. (W23a, 1-2; ST)

387-W. **Flexible High Speed Bar Mill at Phoenix.** Hugh H. Campbell. *Iron and Steel Engineer,* v. 34, July 1957, p. 77-83.

Equipment in 12-in. bar mill consists of continuous reheating furnace, three-high 20-in. roughing stand, cross country mill with six two-high nonreversing 12-in. stands in staggered arrangement and 250-ft. hot-bed with shears; features of mill. (W23d, W20, 1-2; ST)

388-W. **Electrical Features of a Hot Strip Reversing Rougher With Close Coupled Edger.** J. H. Greiner and A. Mozina. *Iron and Steel Engineer,* v. 34, July 1957, p. 88-93.

Electrical drive and control equipment of four-high rougher with close coupled vertical edger using automatic preset screwdown control on both main mill and edger for positioning screwdown and side guides. (W23n, 1-2)

389-W. **Open Hearth Furnaces.** Keith D. Bartels. Paper from "Symposium on High Temperature Refractories." *Iron and Steel Engineer,* v. 34, July 1957, p. 106-109.

Problems encountered with refractories and advantages of higher quality brick in openhearth construction. (W18r, RM-h)

390-W. **Symposium on High Temperature Refractories.** *Iron and Steel*

Engineer, v. 34, July 1957, p. 106-118.

Three papers dealing with the importance of refractories in open-hearth furnaces, reheat furnaces, soaking pits. Papers abstracted separately. (W18r, W20g, W20h; RM-h)

391-W. Reheat Furnaces. Edward E. Callinan. Paper from "Symposium on High Temperature Refractories." *Iron and Steel Engineer,* v. 34, July 1957, p. 109-115.

Problems and experiences with refractories in curtain wall of rotary hearth plate metal furnace and spalling and other problems with roof refractories in strip mill furnace. (W20h, 1-2; RM-h)

392-W. Soaking Pits. E. R. Sullivan. Paper from "Symposium on High Temperature Refractories." *Iron and Steel Engineer,* v. 34, July 1957, p. 115-118.

Difficulties and practices in regard to refractories in soaking pit walls and covers, regenerator roof, bulkhead walls and checker walls. (W20g; RM-h)

393-W. Mold for Titanium Casting. F. W. Wood and R. P. Adams. *Light Metal Age,* v. 15, Aug. 1957, p. 18-20. (CMA)

Skull arc casting of titanium and its alloys is about to become commercial after the development work of the Bureau of Mines. Mold materials are the main problem. Machined graphite molds have been developed which give good detail and may be reused several times. (W19g, 1-2, E10r; Ti)

394-W. Foundry Equipment—No. 1500 Automatic Shell Core Blowing Machine. *Machinery,* v. 91, Aug. 23, 1957, p. 417-419.

New automatic shell core blowing machine produces a shell core of simple cylindrical shape every 15 sec. Six core boxes, carried by an indexing drum, pass through the investment, curing, stripping and cleaning operations automatically and the completed cores emerge from the machine on a conveyor belt. (W19h, 1-2)

395-W. Quenching Oils. *Mechanical World and Engineering Record,* v. 137, Aug. 1957, p. 372-373.

Disadvantages of organic oils from standpoint of oxidation and formation of metallic soaps. Properties of mineral oil as quenching medium. Formula of required quenching medium per amount of work. (W28p; NM-h)

396-W. Furnaces for Annealing and Degassing of Titanium. C. E. Peck. *Metal Treating,* v. 8, July-Aug. 1957, p. 2-3. (CMA)

Special furnaces are required to provide inert atmosphere in annealing and degassing titanium. Retorts of vacuum furnaces are usually cylindrical and may be mounted in various ways. Pumping vacuum between the chamber wall and the retort prolongs the retort life. The Kold-Retort and the Mallory-Sharon type vacuum furnaces are described, and advantages of each are noted. (W27, 1-23, J23, 1-2; Ti)

397-W. Precision Control of Hydraulic Forging Presses. F. H. Towler and B. C. Wilkins. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 217-222.

Analysis of factors affecting depth of penetration for hydraulic forging presses; problems in limiting press stroke by positive stop, cutoff valves and other methods. (W22p)

398-W. Steels for Pressure Die Casting Dies. K. I. Bengtsson. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 227-236.

Thermal stresses in die casting dies; effects of alloying elements on mechanical and physical properties of steel and its resistance to corrosive action of alloy being cast; high-temperature tensile properties of some typical die steels. (W19n, 17-7, Q general, R6m; ST)

399-W. Method Study Leads to Product Redesign. Norman Bashford and Dennis Meredith. *Metalworking Production,* v. 101, July 19, 1957, p. 1231-1236.

Scrap metal baling press and its redesign. (W12s, 1-2; RM-p)

400-W. For Heat Treating Big Titanium Sheets. *Modern Metals,* v. 13, Aug. 1957, p. 56. (CMA)

The vacuum heat treating furnace installed by North American Aviation at Downey, Calif., can be used to degas titanium (at 1100-1400° F.) or to vacuum braze full-size titanium sheet. An internal tube cooling system has been built in for setting the braze on honeycomb titanium prior to moving to a cooling chamber. The furnace removes hydrogen picked up in the chemical milling of titanium. (W27, 1-23, K8j; Ti, 4-3)

401-W. (French.) **Contribution to the Study of Rolling Equipment. Pt. 1, Sec. C., Malleability and Flow of Metal During Hot Rolling.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3501, Feb. 1957, p. 83-90.

Roll maintenance and design in relation to procurement of desired results. Analysis of open, closed and direct pressure passes. (To be continued.) (W23, 1-2, Q23q)

402-W. (French.) **Contribution to the Study of Rolling Equipment. Pt. 1, Sec. C. (Continued.) Malleability and Flow of Metal During Hot Rolling.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3502, Mar. 1957, p. 153-156.

Analysis of indirect pressure passes, widening passes and inclined passes. (To be continued.) (W23, 1-2, Q23q)

403-W. (French.) **The Hot Blast Cupola. A Simple New Method of Recuperating Heat for Heating the Blast.** Georges Ulmer. *Fonderie,* no. 138, July 1957, p. 287-302.

Device has been developed at Centre Technique des Industries de la Fonderie (Casting Industries Technical Center) which makes it possible to pre-heat blast to 400° C. Experimental installation, operation and results. 11 ref. (W18d, 1-2)

404-W. (French.) **New Machine for Preparation of Foundry Sand.** W. Geil. *Fonderie Belge,* Apr. 1957, p. 73-76.

Characteristics and operation of an alternating mixer-malaxator designed for treatment of molding sands. (W19h, 1-2)

405-W. (French.) **High Frequency Ovens for Core Baking and Up-to-Date Organization of Coremaking.** Pierre Fraison. *Fonderie Belge,* no. 78, July-Aug. 1957, p. 175-180.

Behavior of a core in a high-frequency oven; design of such ovens and their advantages; organization of coremaking with modern equipment. (W19k, E19, 1-2)

406-W. (French.) **Conveyor Belts of Bare or Rubber-Coated Steel.** *Revue de l'Industries Minerale,* v. 39, May 1957, p. 437-440.

Sandvik (Sweden) has developed steel belt with two layers of rubber vulcanized on for use in mining industry and others where abrasive materials are handled. Engineering details, installations. (W12r, T28q, 1-2, L26r; ST)

407-W. (German.) **Signalling Equipment for Controlling the Flow of Materials in Steel Works.** Hermann-Ernst von König. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1081-1089.

Flow of materials and telecommunication systems; signalling equipment of the basic converter steel plant; signalling system for the flow of materials to the blooming-slabbing mill; light letters and signs, crane signals and indicating table for the charging of pit-furnaces and ingot signals. (W10, X15, 1-2; ST)

408-W. (Italian.) **Industrial Frequency Induction Melting Furnaces.** Lelio Orsini. *Fonderia,* v. 6, June 1957, p. 269-273.

Types, sizes, uses, operation, accessories, electrical specification, etc., of these furnaces. (W18a, E10, 1-2)

409-W. (Italian.) **Exothermic Products and Protective Varnishes.** G. Zigiotti. *Fonderia Italiana,* v. 6, Mar. 1957, p. 117-118.

Utility of thermogenic products in foundries; protective varnishes for molds and cores; prerequisites of a good varnish; composition of most commonly used varnishes. (W19g, 1-2)

X Instrumentation

Laboratory and Control Equipment

76-X. Use of Zirconium Crucibles for Peroxide Fusions. H. E. Blake, Jr., and W. F. Holbrook. *Chemist-Analyst,* v. 46, June 1957, p. 42. (CMA)

Zirconium crucibles show only slight attack after 20 peroxide fusions. Life expectancy is greater than ten times that of iron, nickel or porcelain crucibles. The contamination problem would be less. Crucibles have been milled from zirconium bars or pressed from zirconium sheet. (X21g, 17-7; Zr)

77-X. New Instrument System Speeds Accurate Checks of Molten Metal Temperatures in Foundry Operations. *Industrial Heating,* v. 24, July 1957, p. 1330-1334.

Immersion platinum thermocouple, protected by a quartz sheath, is connected by extension wire to either a dial-faced indicator or strip chart recorder. (X9q, X9s; 14-10)

78-X. Study of the Utilization of a Solar Furnace for High-Temperature Research on Solids. T. E. Tietz and N. K. Hiester. Stanford Research Institute, (Air Force Office of Scientific Research). *U. S. Office of Technical Services,* PB 121930, Sept. 1956, 10 p. 50c.

Studies of theory, design and cost. (X24f, 16-13)

79-X. (French - German.) **Aluminum Foil in Thermal Insulation.** H. Bosshard. *Aluminium Suisse,* v. 7, May 1957, p. 106-108.

Manufactured under trade name of Alfol, applications include insallation of walls, roofs, reflective surfacing such as in radiant heating, in ovens and ranges and in transport containers. (X24, 17-7; Al, 4-6)

80-X. (French-German.) **Aluminum Foil as a Stabilizing Element in Punched Cards.** O. Muller. *Aluminium Suisse,* v. 7, May 1957, p. 123.

Punched cards are subject to distortions caused by atmospheric humidity. To counter this tendency, found in the operation of the automatic Jacquard looms, cards are now made of aluminum foil backed on each side by paper. The three layer cards are marketed under the trade name of Inexal and are unaffected by variations in atmospheric conditions. (X6, 17-7; Al, 4-6)

81-X. Evaluation of Approaches to the Study of the Physical Nature of Metallic Surfaces. M. K. Testerman. University of Arkansas. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121971, Feb. 1957, 71 p. $2.

An instrument is proposed which makes use of the de Broglie matter waves. Fifty-KV helium ions bombard the specimen at a small angle. The reflected ions are magnified through an ion microscope which detects a signal proportional to the quantity of impinging ions. The surface of the metal is scanned and the detected signal, after being amplified, is recorded as a function of scanning. (X23, 1-2)

82-X. (French.) **Control and Regulation of Martin Furnace Operations—Importance and an Application.** P. Alleyrac and P. Rodicq. *Silicates Industriels,* Apr. 1957, p. 193-204.

IRSID (Insitut de Recherches de la Siderurgie), in cooperation with Ets. de Wendel, steel makers, Hayange, and MECI, Paris, instrument manufacturers, has undertaken a study to improve operating conditions of Martin furnaces by means of a control and regulation device. Instrument developed has made possible determination of best operating conditions for the experimental furnace, increase of approx. 10% in productivity, and improvement by 50% of the strength of the refractories. (X general, D3; ST)

83-X. Sodium Handling Equipment. J. F. Cage, Jr. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 60-66.

Equipment includes electromagnetic pumps, magnetic flowmeters, pressure transmitters and equipment for determining and controlling the oxide content of sodium systems characterized by being completely leakless and having no moving parts. 3 ref.
(X13, X12, 1-2; Na, 14-10)

84-X. Infrared Analyzers Monitor Furnace Atmospheres. J. L. Garrison. *Iron and Steel Engineer,* v. 34, July 1957, p. 145-146.

Note on use of infrared analyzers for following the carbon monoxide, carbon dioxide or methane level in heat treating furnace atmospheres. Principle of infrared analyzer.
(X7; J2k, 1-2)

85-X. Solar Furnace for Research in Nonferrous Metallurgy. W. M. Tuddenham. *Journal of Solar Energy Science and Engineering,* v. 1, Apr-July 1957, p. 48-51.

The installation and its characteristics as well as some of its projected uses. 5 ref. (X24f, 1-3, 16-13)

86-X. Seeing That One Micro-Inch Surface Finish. T. E. W. Preston. *Metalworking Production,* v. 101, July 19, 1957, p. 1237-1241.

Special surface finish microscope designed for examining metal surface irregularity. (X23q, 1-2)

87-X. Modern Metallographic Equipment. J. C. Wright. *Metal Treatment and Drop Forging,* v. 24, July 1957, p. 282-284.

Note on lenses, filters and photographic materials including characteristics of some black and white and color films for metallographic work. 4 ref. (X3c, X5s)

88-X. Modern Metallographic Equipment. Pt. 2. J. C. Wright. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 249-253.

Camera attachments and metallographic microscope for study of metal structures. (To be continued.) (X4a, 1-3)

89-X. (English.) **Symposium on New Metals for the Chemical Industry. Pt. 4. The Use of Tantalum and Titanium for the Construction of Apparatus.** A. A. F. Lagerwey and C. G. Van De Wateren. *Ingenieur,* v. 69, Aug. 2, 1957, p. 113-122.

Tantalum and titanium are expensive metals, and they require special techniques for metalworking. Therefore, these metals are only used where no other metals or alloys are economic in practice. Corrosion resisting properties of the two metals. Preliminary figures for cost of application. (X21, 17-7; Ta, Ti)

90-X. (French.) **Simultaneous Analysis by Impedance Readings and Dilatometry of Changes in Metals and Alloys.** Hervé Guyot. *Recherche Aeronautique,* Mar-Apr. 1957, no. 57-58, p. p. 51-57.

Impedance analysis makes it possible to measure with a good degree of precision resistivity of nonferromagnetic metals, initial permeability and various losses of ferromagnetic metals. Metallurgical interpretation of these properties discussed; examples of application of method to the study of a nonmagnetic refractory alloy, and of allotropic transformation of electrolytic cobalt. Combination device described. 7 ref. (X25, X26, M23b, 1-3)

91-X. (German.) **Use of Thin Metal Foil as Image Amplifier in X-Ray Technique.** Fritz Günther and Bruno Beyer. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 207-212.

Investigation into image amplification effect of lead, tin, zinc and copper foil in the wave length applicable to visual inspection. 10 ref. (X5, 17-7; Pb, Sn, Zn, Cu, 4-6)

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Because the Show is staged in Dallas' spacious State Fair Park, only two miles from the city's center and downtown hotels, you'll be able to put your best foot forward before a top level audience looking for just what you've got to offer. There never was a finer exhibition hall – all on one level – airy, bright. It puts visitors in the right frame of mind to buy. It will be bristling with ideas and thronged with buyers.

Get your share of this new market. The Southwestern Metal Show is the place to sell! Act today – select your space. If you don't have floor plans, write us NOW. You'll reap a harvest from this new and finer Metal Show. To assure success in '58 – Don't Hesitate!

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DALLAS, TEXAS

MAY 12-16, 1958

Southwestern Metal Exposition

W. H. EISENMAN, *Managing Director* • CHESTER L. WELLS, *Assistant Director*

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State Fair Park Is Only Two Miles from Downtown Hotels

METAL SHOWS OWNED AND OPERATED BY THE AMERICAN SOCIETY FOR METALS

materials, special alloys, Alnico magnets. Box 10-35.

WELDING ENGINEER: Desires staff position in consulting, coordinating and/or directing capacity in research, development, manufacturing, production and vendor control activity. Twenty years experience in metal processing, aircraft, jet-engine, missile and related fields. Thorough knowledge of honeycomb, titanium and all ferrous and nonferrous metal joining problems. Relocation and travel acceptable. Box 10-40.

METALLURGICAL CHEMIST: Ph.D. equivalent, age 44, married, family. Wide experience in chemical milling, plastics, ferrous and nonferrous alloys, fuels, explosives, metal finishing, electrochemistry, corrosion problems, adhesives, bonding, physical testing, aircraft, textiles, etc. Would like to relocate in South or Southwest. Present salary $8400. Moving expenses required. Box 10-45.

PHYSICAL METALLURGIST: Ph.D. degree, age 34. Excellent record heading metallurgical laboratory for smaller company. Results include successful development of new alloys and technique necessary for their commercial fabrication. Thorough solid state background. Available for interview at National Metals Show in Chicago week of Nov. 3. Box 10-50.

METALLURGIST: B.S. degree, age 34, eight years diversified experience as plant metallurgist and laboratory supervisor testing and developing fans, heat exchangers and refrigerating equipment. Experienced in fabrication, soft soldering, silver soldering, and allied welding processes, material specifications, and investigations of corrosion and mechanical failures. Desires position with future in production or product development. Box 10-55.

METALLURGICAL ENGINEER: B.S. degree, age 41, married. Five years experience as process and quality control metallurgist of titanium sheet mill products. Twelve years experience as process, development, product and quality control metallurgist for large steel corporation. Desires responsible position with a progressive company. Box 10-60.

METALLURGICAL ENGINEER: Powder metallurgy. B.S. degree, age 33, married. Four years with major iron powder producer, two years as chief metallurgist. Assisted in establishing production and quality controls for iron powder production. Headed control laboratory and development work. Some sales contact. Box 10-65

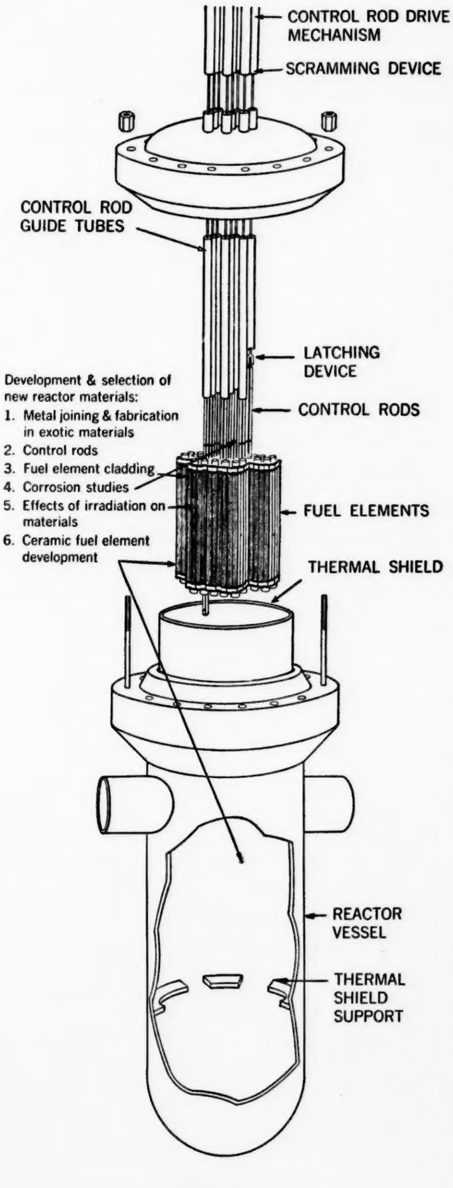
METALLURGIST: Materials and standards engineer, age 36, married, family. Desires to make change with opportunity for higher advancement. Exceptional broad field of experience including supervisory and administration, organic and inorganic finishing, heat treating, technical writing, consulting. Box 10-85.

METALLURGICAL ENGINEER: B.S. degree, masters theses, age 28, married, family, veteran. Five years experience with wrought and cast ferrous and nonferrous alloys, including high-temperature materials. Background includes failure analysis, manufacturing and design problems, material evaluation, laboratory supervision, corrosion studies on high-temperature materials. Previous experience was with sand and shell molded castings. Box 10-90.

RESEARCH DIRECTOR: M.S. degree, age 50, family. Twenty years industrial experience in ferrous metallurgy, including every phase of extractive metallurgy. Background includes number of basic research projects. Author of books and number of papers and patents. Would like to take appointment as professor of metallurgy February or September 1958. Box 10-95.

METALLURGIST - METALLOGRAPHER: Fifteen years accumulative laboratory experience. Last seven years closely associated with manufacture of jet engine parts and production of alloys for high-temperature applications. Research and development metallography on superalloys a specialty. Age 32, married. Experienced as chemist, spectroscopist, metallurgist and metallographer. Prefers East, other locations considered. Box 10-100.

SUPERVISING METALLURGIST: With extensive experience in research, development, physical testing, process engineering and supervision of laboratories, production departments and complete foundries. B.S. in chemical engineering and 25 years experience in industry. Aggressive and cooperative. Will locate anywhere in the U.S. or certain foreign countries. Box 10-105.



METALLURGICAL ENGINEER: Canadian, age 43, experienced in plant management, sales and technical development. Background experience covers mechanical and chemical fields. Specialized knowledge of the casting and rolling of aluminum alloys. Desires position in technical development or plant management. Minimum salary $12,000. Complete resume on request. Available immediately. Box 10-115.

METALLURGICAL TECHNICIAN: A.A.S. degree in metallurgical technology, age 26, married, veteran. Three years full and part-time diversified nonferrous foundry experience. Two and one-half years tool and specialty steel mill. Experience in the metallography and heat treatment of magnet alloys, tool, stainless and heat resistant steels, zirconium, thorium and uranium, coupled with the techniques of rolling and forging. Desires responsible position in related fields. Resume upon request. Box 10-120.

CHEMIST-METALLURGIST: M.S. degree in chemistry. Additional technical and business schooling. Chief of materials laboratories of manufacturer of appliances and miscellaneous products. Extensive experience in metallic and nonmetallic materials engineering; especially paints, platings, surface coatings and treatments and corrosion. Research and development including mechanical projects; fuels and gas chemistry; instrumentation; technical writing. Cooperates well. Available for technical management or research in Cleveland or vicinity. Box 10-125.

METALLURGICAL ENGINEER: Desires responsible technical development position with a growing progressive organization. Ten years of development, production and customer experience in the application, processing and manufacture of high-temperature alloys, vacuum alloys, alloy steels, etc., in wrought and cast forms. Age 37, houseowner. Box 10-130.

METALLURGIST: Graduate, with over 16 years experience in research, development and materials application and processing, desires responsible position in materials engineering, sales or product development, offering opportunity for further growth. Supervisory experience and ability to get along with people. Present salary in low five figures. Box 10-135.

MECHANICAL ENGINEER: Degrees and certificates in mechanical engineering, toolmaking, electronics, machinery production. Owned tool shop in Europe, 1927 to 1949. Married, family, recently arrived from Europe. Over 60 international patents on tools, automation devices, etc. Speaks German, Hungarian, limited English being improved by accelerated 8-hr. day course at present. Over 30 years broad experience in all phases mechanical engineering. Desires consulting work, manufacturing trouble shooting, solving problems in large factories, machine tool problems. Box 10-140.

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

Central Research Laboratory
Pittsburgh, Pennsylvania

CERAMIST

Requires advanced degree in ceramics or physical chemistry coupled with at least ten years' experience in refractories, powder metallurgy, magnetic materials, etc., to direct challenging research problems in these fields.

Send resume in complete confidence

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P. O. Box 88
Pittsburgh 30, Pa.

METALLURGISTS

Ph.D or M.S. scientists for basic research in high-temperature materials; magnetic materials; plasticity; mechanism of fracture; effect of alloys and impurities. All the above research on civilian projects.

For further details write to:

M. C. Rohm,
Employment Section
Allis-Chalmers Mfg. Co.
Milwaukee 1, Wisconsin

RESEARCH METALLURGIST

Physical metallurgist for basic research in the behaviour of metals at elevated temperatures. PhD with or without experience.

Company-sponsored research program with a liberal publication policy. Excellent experimental facilities.

Write or Phone

W. A. JOHNSON
Associate Director of Research
Thompson Products, Inc.
23555 Euclid Avenue
Cleveland 17, Ohio

CHIEF METALLURGIST

To assume full responsibility for all metallurgical activity in manufacturing razors and razor blades.

Degree in metallurgy and knowledge of ferrous metallurgy indispensable. Should have a minimum of ten years' experience with some in a supervisor capacity.

Experience with high carbon strip, steel making, metallography, copper and aluminum alloys desirable.

Send resume, including present salary, in complete confidence to:

D. M. De Hart
GILLETTE SAFETY RAZOR COMPANY
Gillette Park
Boston 6, Massachusetts

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

Central Research Laboratory
Pittsburgh, Pennsylvania

MECHANICAL ENGINEER

Requires advanced degree in mechanical engineering or metallurgy with experience in both technical disciplines. Should have a minimum of ten years' experience in development of metal working processes and equipment. Competence in handling engineers associated with the working of metals is desirable.

Send resume in complete confidence to

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P.O. Box 88
Pittsburgh 30, Pa.

PRACTICAL IMAGINATION

Is the prime requisite for this sales promotion - market development opening with major Midwest steel company. Writing and public speaking ability also important although these skills can be polished on the job.

Major part of job involves finding new uses for special alloy steels or extending present applications. Some travel necessary.

Company policy of promotion from within limits consideration to relatively recent engineering or science graduates.

Box 10-70, Metals Review

FOUNDRY RESEARCH SUPERVISOR

Internationally known research organization has excellent opportunity for an experienced metallurgist to administer the activities of its Foundry Research Section. This individual will direct diversified technical programs as well as maintain close customer contact.

He should have a minimum of a B.S. degree and ten years of diversified research and practical experience. This is a permanent position with an expanding organization offering unusual opportunity for personal and professional development.

Located in Midwestern metropolitan area, we offer a generous relocation allowance along with outstanding vacation, insurance and retirement benefits.

Please send complete resume. All replies will be treated as confidential.

Box 10-75, Metals Review

Symbolism has been used throughout history to express elements or ideas. The symbol above is the ancient chemical sign for *annealing*. The symbol below — the signature of a fast-moving, expanding company in which annealing plays an integral part in stress-relieving so many products.

Metals and Controls Corporation offers engineers, metallurgists and physicists a challenging career in most fields of engineering.

We produce electro-mechanical control devices; and engineer and manufacture composite metals to meet the multiple requirements demanded in a single piece of material. A leader in the nuclear field as well, Metals and Controls is the nation's first privately-owned producer of fuel elements for atomic reactors.

Before you accept a position, learn what Metals and Controls Corporation can offer you. For further information, write for our free booklet entitled "Your Opportunities at Metals and Controls."

METALS & CONTROLS
CORPORATION
340 Forest Street
ATTLEBORO, MASSACHUSETTS

2 RESEARCH METALLURGISTS

With BS or MS degrees. One position is for a recent graduate. The other is for a man up to 35, with experience in the application of metallurgy to production problems.

Work in applied research, dealing with welding ferrous and non-ferrous alloys, investigation of service problems, and selection of materials of construction.

C F BRAUN & CO
Alhambra, California
Engineers and Constructors

Permanent Positions

X RAY METALLURGY
Preferred Orientation, Phase Identification, Transformation, and special problems.

PHYSICAL METALLURGY
Alloy development, Constitution, and properties.

MECHANICAL METALLURGY
Development of metal working techniques and correlation with properties.

PROCESS METALLURGY
Pilot development of new alloys and processes, special orders, quality control.

PROCESS ENGINEERING
Mechanical and economic aspects of non-ferrous strip, rod, and tube mill operations.

BRASS
Bridgeport
CO.

with EXPANDING ORGANIZATION

in non-ferrous products offering excellent opportunities for advancement.

Liberal salaries and employee benefits.

Locations:

Southern Connecticut and Midwest.

We are interested in applicants at all levels of experience.

Write

Mr. T. F. Burns
Employment Manager

Bridgeport Brass Co.
30 Grand St., Bridgeport 2, Connecticut

METALLURGISTS

IF YOU . . .

Would like to have a part in solving interesting research problems

Would like to feel that your future is limited only by your own vision, ability and effort

Are willing to assume responsibility

WE . . .

Would like to assist you in such personal progress

Drop a line to . . .

Russell S. Drum
Personnel Manager
BATTELLE INSTITUTE
Columbus 1, Ohio

METALLURGICAL OR CHEMICAL ENGINEER

For Product Development and Technical Service in the nonferrous field, primarily zinc and lead. Prefer four to ten years experience in application technology such as galvanizing but will also consider production experience in these metals. Salary commensurate with qualifications. State education, experience, salary expected.

Gilbert E. Wermert
The American Metal Company, Ltd.
61 Broadway, New York 6, N. Y.

METALLURGISTS

Positions offering unusual professional growth opportunities with expanding Atomic Energy Division of long-established manufacturer of power generating equipment. Minimum requirements—degree plus experience in practical metallurgy and fabrication of carbon and stainless steels. Knowledge of fuel element fabrication and/or other metallurgical and fabricational applications peculiar to atomic power generation desirable but not essential. Send resume and salary requirements to:

ALCO PRODUCTS, INC.
Employee Services Department
Schenectady 5, N. Y.
ALL REPLIES KEPT CONFIDENTIAL

METALLURGIST

B. S. Metallurgist—Some experience required. For research and development work in physical metallurgy. Work involves the study of uranium and some uranium alloys.

Challenging opportunity in this progressive, expanding laboratory located in the delightful mountain area of Northern New Mexico. Excellent salary schedules, liberal benefits.

Send resume to:

Recruiting Department
LOS ALAMOS SCIENTIFIC LABORATORY
of the
University of California
P. O. Box 1663
Los Alamos, New Mexico

METALLURGISTS

Steel company located in Northeastern Ohio has several openings for metallurgical graduates interested in titanium research and production control.

Box 10-80, Metals Review

HORIZONS.....

Has open supervisory research positions in expanding Metallurgy Department in the fields of physical metallurgy, mechanical metallurgy, physical chemistry, precision casting and powder metallurgy. Unusual opportunities for individual diversification, intellectual advancement and personal stimulation. Please apply to Laboratory Manager:

HORIZONS INCORPORATED
2905 East 79th Street
Cleveland 4, Ohio

Graham Laboratory, Jones & Laughlin's modern research center in Pittsburgh, Pa.

RESEARCH METALLURGISTS

Several attractive openings are available for metallurgists, with graduate level training or equivalent research experience, to participate in expanding research and development programs in PROCESS, PRODUCT, AND PHYSICAL METALLURGY.

Work will be carried out in our modern laboratories in suburban Pittsburgh. Excellent opportunities are available for professional advancement in a young and growing organization.

Send resume, in confidence, to:

J. A. Hill
Research and Development Department
JONES & LAUGHLIN STEEL CORPORATION
3 Gateway Center
Pittsburgh 30, Pennsylvania

J L STEEL

METALLURGISTS and METALLURGICAL ENGINEERS

Opportunities exist for both recent graduates and those with several years' experience in research, development, failure analysis, heat treating, corrosion testing, metallography, welding and general applications of metallurgy. Fully equipped, modern laboratory in Southern Ohio. Send reply with resume and salary information to:

Employment Department, L-58
Goodyear Atomic Corporation
P. O. Box 628
Portsmouth, Ohio

IMMEDIATE OPENING

CRUCIBLE STEEL CO. OF AMERICA

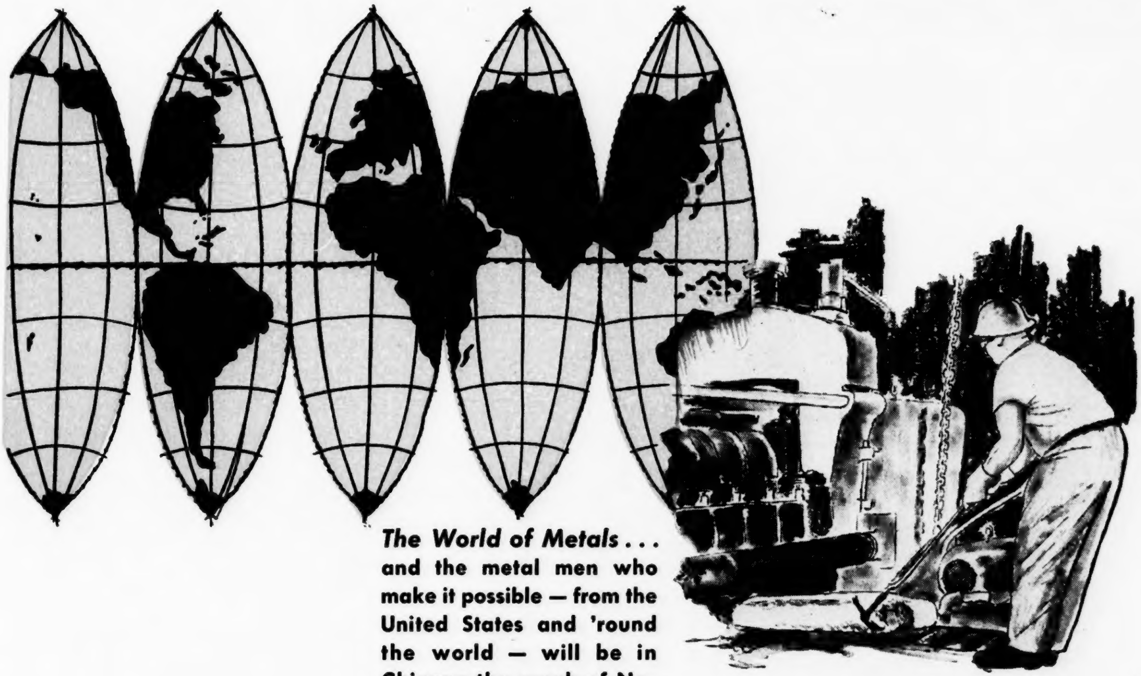
Central Research Laboratory
Pittsburgh, Pennsylvania

APPLIED RESEARCH PHYSICIST

Requires advanced degree in physics or mathematics to undertake high level research activity in solid state of ferrous alloy systems and nonmetallic magnetic materials.

Send resume in complete confidence

Mr. E. J. Martin
CRUCIBLE STEEL CO. OF AMERICA
P.O. Box 88
Pittsburgh 30, Pa.



The World of Metals . . . **and the metal men who make it possible — from the United States and 'round the world — will be in Chicago the week of November 4 to attend the**

39th National Metal Exposition
2nd World Metallurgical Congress

Overseas visitors from 38 foreign countries will join 50,000 American metal men in the greatest presentation of ideas and product developments the world has seen . . . at Chicago, the week of November 4.

Scores of scientific and practical sessions on metals — their production, processing, fabrication and application — will be the world forum for noted authorities. Overseas experts, fresh from a series of eight metalworking tours of the United States, will meet with American authorities in Chicago for the exchange of engineering information.

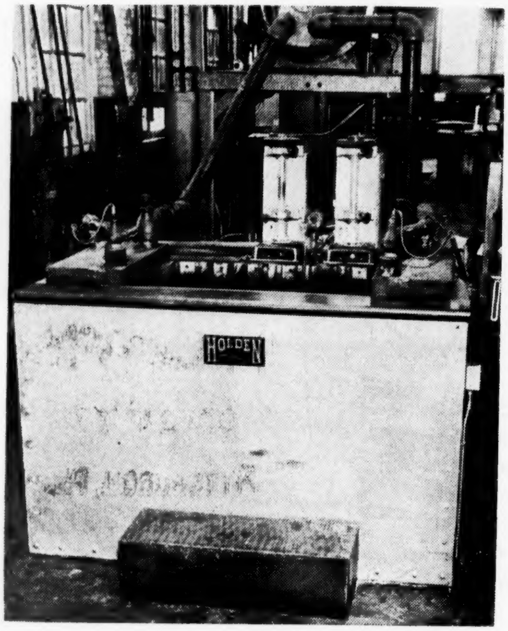
They will see a vast array of metalworking exhibits in the International Amphitheatre and Exposition Hall. More than 500 metalworking firms will display their newest product developments, most of them in actual operation. It will be a Metal Show to remember . . . a Metal Show the like of which has never been seen.

This is the world event that has been in the making for four years. This is the world event you and your associates in management, engineering production and sales will want to attend. Mark the date — November 4 to 8. The place — Chicago's International Amphitheatre and Exposition Hall. Plan to be there. For hotel reservations write: Metal Show Housing Bureau, c/o Chicago Convention Bureau, Inc., 134 N. LaSalle Street, Suite 900, Chicago 2, Illinois.

Cooperating Societies: Metals Division, American Institute of Mining, Metallurgical and Petroleum Engineers . . . the Society for Non Destructive Testing . . . the Industrial Heating Equipment Association.

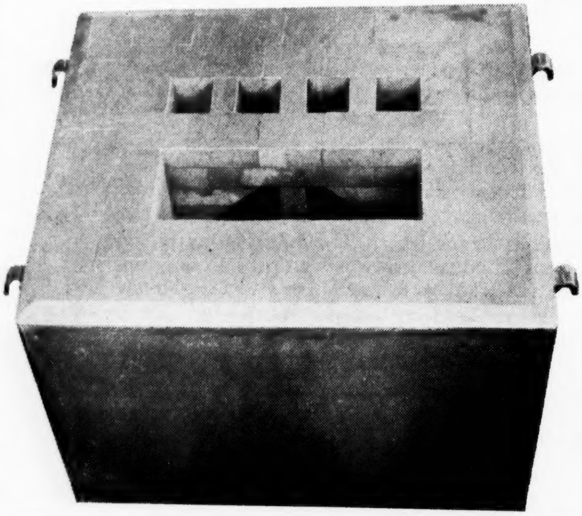
AMERICAN SOCIETY FOR METALS
The Engineering Society for the Metal Industry
7301 Euclid Avenue Cleveland 3, Ohio

METHODS OF FINANCING INDUSTRIAL EQUIPMENT INSTALLATIONS



HOLDEN—TYPE 401
Gas Fired Marquenching-Austempering

HOLDEN—TYPE 701
Inner Furnace Assembly 1000° F to 2300° F



1. A Conditional Sales Contract
2. Sum of the Digits or Declining Balance Methods
3. Leasing or Renting

DIRECT COST AS FOLLOWS:

1. Conditional Sales Contract or sum of the Digits plan—down payment of 25%.
2. A 2 year Conditional Sales Contract equals a 12% interest or service charge.
3. Sum of the Digits methods for 5 years equals approximately 24% interest or service charge.

WHAT IS A LEASE?

A LEASE is a contract usually for a specified rent for a term of from 2 years to 10 years. Normal LEASE terms for buildings are usually a 3 months deposit or a 6 months deposit depending on the length of the LEASE.

LEASE TERMS—INDUSTRIAL FURNACES

(2 YEAR CONTRACT)

1. There is a 12% interest or service charge for the initial 2 year LEASE.
2. At the signature of the LEASE, 3 months rent is paid.
3. There are 21 equal LEASE payments after delivery of the equipment under the LEASE.
4. In the last 60 day period of the LEASE term, the LEASE may be extended either for 1 year or for 3 years.

LEASING AND PROFITS:

1. LEASING is a direct expense without investment.
2. Any other method used 25% initial down payment, plus service or interest charges.

THE A. F. HOLDEN COMPANY

3 F.O.B. Points for Holden Metallurgical Products

EXECUTIVE OFFICES AND PLANT
- 14341 SCHAEFER HIGHWAY,
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- 460 GRAND AVENUE,
NEW HAVEN 13, CONN.

WESTERN PLANT
- 4700 EAST 48th STREET
LOS ANGELES 58, CALIF.